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Mexican Potential

MEXICO's imports have been running in recent years at a level of around £400,000,000 per annum, capital goods accounting for 80 per cent. of the total. Britain's share of this trade last year was only £14,000,000, or less than 4 per cent. Mexico would therefore seem to offer a great potential for British goods, and it is for this reason that it has been decided to hold two specialized all-British trade fairs in Mexico City in September and November of next year. The fairs, sponsored by the Federation of British Industries and the Dollar Exports Council, have received the blessing of the Board of Trade.

Mexico City has been selected as the centre for the fairs because 70 per cent. of all Mexican industry and commerce is located there. Mexicans predict that in the next decade their capital will have more than doubled its present 5,000,000 population and become a business centre comparable in importance with London, Paris, or New York.

It is present policy of the Mexican Government to restrict by quota imports of consumer goods, but to welcome the importation of manufactures required by Mexican industry and agriculture. It is in capital goods and production goods, therefore, that Mexico offers markets for British manufacturers. The FBI and the Dollar Exports Council are convinced that the prospects are good. It is estimated that Mexico's gross national product will go on increasing at the rate of 5½ per cent. per annum. The process of rapid industrial and agricultural development is heavily dependent on supplies from abroad of capital and other producer goods. Mexico wants to do business with Europe. US exports to Mexico declined from 80 per cent. in 1954 to 73 per cent. in 1959, while exports from all Western European countries increased.

In some sectors US manufacturers are too firmly entrenched to be moved to any extent. Mexico is anxious to extend her railway network. Because of the long distances, dieselization is preferred to electrification and it seems inevitable that the diesel locomotives required will be brought in from North America. There is plenty of scope, however, for other countries, and Britain in particular, in the supply of railway equipment generally—not excepting electrical equipment, since electricity may well be favoured for railway traction over short distances—for example, on suburban routes. Like Canada, Mexico dislikes too close reliance on US industry.

There would appear to be scope for an expansion of exports of British iron and steel products to Mexico, which is also anxious to expand her own metallurgical industry, so that there would seem to be a chance, too, of selling steelworks plant there, though extended credit would probably be required. Mexico also has a coal-mining industry, which will need to expand as her economy develops. This suggests the possibility of exporting British mining machinery to the country.

Among the reasons advanced by the FBI in support of a sales drive in capital goods are these: Large sums are being spent on irrigation, power supplies (hydro and thermal electric), and agricultural developments, creating a great demand for industrial equipment of all kinds; Mexican credit is good (at present Mexico is regarded by the Exports Credit Guarantee Department as an above average market); the Government is stable (the same party has been in power for over 40 years); and, unlike many other Latin-American countries, the economy is broadly based, not dependent on any single commodity.

Western Germany held a technical trade fair in Mexico in 1954 and has since more than doubled its exports—from 3 per cent. to 7 per cent. Britain, the FBI believes, could do the same. We might even do better.

MI Consolidates Australian Companies

AUSTRALIAN interests of Metal Industries, Limited, are to be reorganized. Its wholly-owned subsidiary, Lancashire Dynamo Coates Pty., Limited, Melbourne, is being amalgamated with Godfrey Electrical Industries Pty., Limited, Sydney, by the establishing of a new company to take over both businesses. The ordinary and half the preference capital of Godfrey Electrical was already held by MI and it has now bought the rest of the preference shares.

The new company will be known as M.I. Australia, Limited. All manufacturing activities will be concentrated in the Chatswood (Sydney) factory. The sales and service department will also be centred there with a sales and service branch in Melbourne. Mr. W. McPherson has been appointed chairman of the new company with Mr. D. J. Buckingham, formerly general sales manager of British Insulated Callender's Cables (Australia), Limited, as general sales manager.

Lancashire Dynamo Coates imports, manufactures, and assembles electric motors, transformers, and other equipment under licence from UK factories in the MI group. Godfrey Electrical makes switchgear under licence from J. G. Statter & Company, Limited, another MI British subsidiary. The negotiations in Australia were conducted for the parent company by Mr. F. H. Schroeder, a director, and Mr. D. H. Roberts, the secretary.

Passing Thoughts . . .

WE would like to see more constructive thought, more sense of responsibility, less lazy mindedness, indifference, and defeatism. We would like to see more tolerance and understanding and less persecution, bureaucratic rigidity, crankiness, and busybodying. We would like to see moral questions judged in terms of humanity and knowledge and not in terms of prejudice. We should all welcome sensible practical action instead of gestures, demonstrations, or abstentions.—SIR CYRIL HINSHELWOOD, FRS, in his Commemoration Day address at the Imperial College of Science and Technology, University of London.

Management is apt to be too busy and not have enough time to open its mind to new techniques. There is a rather rigid approach to organization in industry and more flexible thinking is needed. Today management might well be much more important than ownership.—LORD SHACKLETON in *a House of Lords' debate.*

It is not surprising that people are up in arms at the proposal to permit ironstone mining over several thousand more acres of north Oxfordshire. . . . Permission has not yet been granted, and the company's [Richard Thomas & Baldwins, Limited] application is to be the subject of an inquiry conducted by the Ministry of Housing and Local Government. . . . However impartial a Government inspector may try to be in a case like this it is wrong in principle that the Government should be both judge and jury in matters touching directly on so many aspects of its own policy.—THE GUARDIAN.

Too many British manufacturing concerns are failing to back their products with a proper sales effort. It is almost as though having established the manufacturing unit they now claim that the world owes them a living.—MR. D. R. GRIFFITHS, *director of the Incorporated Sales Managers' Association.*

Amalgamations produce economies and more balanced outlook. I welcome these big amalgamations because I think they will, in the long run, strengthen British industry and be an advantage to the consumer. —MR. REGINALD MAUDLING, President of the Board of Trade, at a Newquay Conservative conference.

I have been called "a coward" by a newspaper, "a political hoodlum" by a Coal Board official, and "the Kidderminster carpet-bagger" by someone else. . . . It's all part of political life.—MR. GERALD NABARRO, MP.

We do not achieve the drive, momentum, the unity of purpose . . . that we achieved when we were faced by . . . the enemy submarine or the enemy aircraft. Yet to fall short in exports and consequently to be short of imports, is a menace just like that of the submarine. It only differs in one respect—it is less dramatic.—LORD CHANDOS, in his presidential address at the annual conference of the Institute of Directors.

THE MEXICAN iron and steelworks and tube specialists, Tubos de Acero de México, SA, has announced plans to introduce a new pig-iron blast-furnace by 1963. This unit will supply the full demand of the company's steelworks, which at present produces 160,000 metric tons annually and is expanding yearly output to 200,000 tons. By the end of the current year the company is to open a new tube works to increase annual tube output to 130,000 tons.

Minister Told of Miners' "Lack of Confidence"

FOLLOWING a meeting on Wednesday at which the Minister of Power (Mr. Richard Wood) met leaders of the National Union of Mineworkers, Mr. Sidney Ford, the NUM president, said that the Minister had been told that there was "a serious lack of confidence among the workers in the industry, as evidenced by the inability of the Coal Board to hold its manpower and recruit new staff." One of the very worrying problems was the failure to recruit young workers, he said.

Mr. Ford said that manpower shortage accutely affected every coalfield, but South Wales in particular. "Never since the 18th century has the labour force of the mines reached such a low level as at present," he said. During the last three and a half years it had declined by 125,000, mostly due to the deliberate policy of cutting production and closing pits.

The NUM officials urged the Government, through the Minister, to put a special tax on fuel oil and to relieve the NCB of its financial burdens, particularly the expense of stocking coal, importing large coal, and paying heavy interest charges.

The NUM president said that he and his colleagues were very disappointed at the Minister's reactions. Mr. Wood had promised, however, to give the union a detailed reply to its case in the form of a memorandum in about two weeks' time. The NUM would then decide whether to see Mr. Wood again or to ask the TUC to approach the Government, "perhaps at a higher level."

West Midlands NCB Appointment

FOR the past 12 months departmental secretary, production department, at the headquarters of the West Midlands Divisional Coal Board, Dr. P. W. Glover has been appointed to succeed Mr. E. K. Waterhouse as assistant divisional secretary. Mr. Waterhouse was recently appointed divisional secretary.

Dr. Glover, who is a member of a family with a long working association with the coal industry, graduated at Oxford and while working for his doctorate studied for a year at the University of Alabama, USA. He joined the National Coal Board as an administrative assistant in 1953, was appointed administrative officer, marketing department, Division/Midland sales region in 1955, and a year later became a section head in the staff department at divisional headquarters.

Industrial Production Levels Out

LATEST adjusted figures of the index of industrial production issued by the Treasury indicate that the level of output is now virtually static. The provisional figure for the index in September is 120-121, compared with 121 in August, and in every month, except June, since April.

The Ministry of Labour states that between September 8 and October 5 there was an increase of 1,000 vacancies in coalmining. The number of vacancies in engineering during that period decreased by 2,400. On October 10 there were 328,503 unemployed in the country. Between September 12 and October 10 a further 4,000 men were unemployed in shipbuilding.

Iron Industry is Commended

ESSENTIAL TO INDUSTRIAL ECONOMY, SAYS PRINCE PHILIP

BY any test the iron industry was still an essential part of the British industrial economy, and one which by its efficiency or inefficiency could have a decisive effect upon our chances in world markets, said the Duke of Edinburgh in London on Tuesday. "I congratulate the industry and the Joint Iron Council on what they have achieved so far, and I would urge them to keep up—indeed, to step up—the good work so that this old industry will be looked upon by old and new alike as an example of what a British industry should be. Traditional skill in workmanship and management, combined with modern techniques should make this possible, and the whole nation will be richer for it," Prince Philip said.

The Duke of Edinburgh was proposing the toast of "The Iron Industry" at a banquet of the Joint Iron Council held in London's Guildhall. Historically, the Iron Age started some 3,000 years ago, he said, but industrially speaking the modern Iron Age started, or started with, or was started by, the industrial revolution.

Like the chicken and the egg it was difficult to disentangle which came first. Whichever it was it was quite certain that the iron industry was the mainspring of the industrial expansion and prosperity of these islands during the 19th century. To this day it was indispensable to heavy engineering, which was still a British speciality.

Important Place

"The iron industry has long held a particularly important place in the economy of the British Isles," the Prince continued. "Unfortunately, its very age and importance tend to make progress and improvement quite an uphill struggle. The great centres of iron production and ironfounding have bred communities with special skills and traditions, but those communities grew up before anyone had even heard the expression industrial relations. Their towns were built before anyone took industrial town planning seriously. The works themselves just grew with demands and when odd bits of land became available.

"Training was limited to apprenticeship, which, as a system, was intended to meet an entirely different order of industrial organization. University degrees or technical diplomas, courses for foremen, or training in management, were not only unheard of, but undreamed of.

"Within the industry the genius of the old ironmasters gave the industry an undisputed lead throughout the world at the end of the 18th and the beginning of the 19th centuries. While research as a word would have baffled those men, their advice was sought on the Continent and their men were sent to train foreign workmen.

"In face of this, no one would be surprised to find that the iron industry of today still existed on its traditions of greatness, obstinately refused to recognize change, or rose up in anger at any word of criticism. In fact the situation is quite different. There is a proper awareness of the responsibilities of management and industrial relations are getting the attention they deserve. The British Cast Iron Research Association has done great work and the results of its scientific and technical research are welcomed and applied and mechanical aids are improving productivity. Education and health are also getting their full share of serious consideration."

Instead of running bleating to the Government the industry had corrected its own faults; instead of blaming everything and everyone else when business declined the industry set about putting its own house in order. By any test it was still an essential component in our industrial economy, the Duke of Edinburgh concluded.

The banquet was held under the chairmanship of Mr. N. P. Newman, president of the Joint Iron Council, who responded to the toast proposed by the Duke of Edinburgh. Mr. Malcolm J. Glenny, chairman of the Council of Ironfoundry Associations, proposed a toast to the "Lord Mayor, the Corporation of London, and the Sheriffs," to which Sir Edmund Stockdale, Lord Mayor of London, responded. Mr. Richard Wood, MP, Minister of Power, replied to the toast of the guests, proposed by Mr. N. C. Macdiarmid, vice-president of the Joint Iron Council and chairman of the Council of Iron Producers.

It had been reported to the Joint Iron Council earlier in the day that ironfoundry production in the second quarter of this year was 14 per cent. up on the second quarter of 1959. In the 12 months to June 30, 1960, production of castings was 15 per cent. higher than in the previous corresponding period.

Wimpey to Instal Spencer Rolling Mills

THREE rolling mills which are being constructed for the Spencer Steelworks at Llanwern (Mon) of Richard Thomas & Baldwins, Limited, by the United Engineering & Foundry Company, in Pittsburgh, US, are to be installed by George Wimpey & Company, Limited, London, W.6. The three mills are a 45 in. by 80 in. 2-high universal slabbing mill, a 22 in. and 60 in. by 68 in. 4-high stand tandem cold mill, and a 22½ in. and 60 in. by 68 in. 4-high temper pass mill, and together they comprise 10,000 tons of heavy plant.

The equipment will be shipped to Newport docks and hauled the seven miles to the steelworks site. The construction work is being carried out by Wimpey's mechanical and electrical engineering department and is due to begin in February, 1961, and finish in the following October.

Appointments

Consultation Officer for Northern NCB

NEW consultation officer for the Northern (N&C) Divisional Coal Board is Mr. ALEXANDER K. CHAMBERS, assistant manpower officer, of the division's No. 3 Area. He succeeds Mr. S. Forster who was recently appointed secretary of the industrial relations department.

Mr. Chambers started work at the age of 14 as an office boy in the welfare department of the Ashington Coal Company, Limited. After service in the last war in the RAF he rejoined the Ashington Joint Welfare Committee and subsequently went to the Northumberland and Cumberland region of the Miners' Welfare Commission. He has been secretary of the divisional first-aid committee since 1946.

Mr. ARTHUR MARSH, tin house superintendent at the Ebbw Vale works of Richard, Thomas & Baldwins, Limited, has retired.

Mr. J. S. HOUGHTON has been appointed general manager of the Midland Tunnelling Company, Limited, Hyson Green, Nottingham.

Mr. J. MELVYN ROSE has been appointed general manager of M. & H. Mining Contractors, Limited, Thurcroft, near Rotherham (Yorks).

Mr. J. P. L. THOMSON has been appointed sales manager of Woden Tools, Limited, manufacturers of engineers' tools, of Wednesbury (Staffs). He succeeds Mr. R. F. Wills who has retired from the board.

Formerly signal engineer to the Scottish region of British Railways, Mr. L. J. M. KNOTTS has joined Mullard Equipment, Limited, as technical adviser on the application of electronics to railway signalling and communication systems.

Dr. F. BAKHTAR has been appointed a lecturer in the department of mechanical engineering, Birmingham University, and Mr. R. H. HOLLIER to be Tube Investments senior research fellow in the department of engineering production at the university.

Mr. J. L. THOMSON, assistant marketing manager of the Central East Area of the Scottish Divisional Coal Board, has been elected president of the Glasgow Commercial Exchange. Mr. L. R. Fairlamb, Wm. Cory & Sons, Limited, has been elected vice-president.

Successor to Mr. G. L. DENNIS, recently promoted to superintendent, personnel services, as administrative officer, personnel department, of the steel division of the Steel Company of Wales, Limited, is Mr. DAVID HERMAN, who joined the company on leaving school.

Appointed resident representative in Hull of the machinery division of George Cohen, Sons & Company, Limited, Mr. E. M. THOMAS comes from the division's head office in London. He succeeds Mr. H. WHYMAN, who has now been appointed manager of the division's Kingsbury branch. Mr. Thomas's address is 79, Eppleworth Road, Cottingham, Yorks (telephone: Cottingham 47263).

Pollard Ball & Roller Bearing Company, Limited, announces that Mr. N. A. SLATER, who has been appointed commercial manager, will be based at the Ferrybridge works of the group. Mr. Slater joined the company early in 1958 as manager of the subsidiary concern, Whitehouse Industries, Limited, Philidas division. From 1947 to 1958 he was also general works manager of two associated factories on Tyneside. He will be responsible for commercial aspects of the group at home and oversea.

To further its reorganization on a divisional basis BTR Industries, Limited, has appointed Mr. G. W. WILLIAMS as southern area sales manager of the belting division and Mr. G. E. PLOWS as northern area sales manager of the division. In the general mechanicals division of the company, Mr. J. ETCHELLS has been appointed divisional marketing manager with Mr. P. M. HARTLEY as sales manager for transmission belting and other rubber/metal products, and Mr. F. T. METHERELL as sales manager for general rubber and plastic products. Mr. W. N. EVANS has been appointed designs services manager of the division and Mr. H. N. ADAMS, northern area manager.

NCB's Chief Safety Engineer Retires

AFTER 35 years in the coal-mining industry, Mr. William F. Richardson, chief safety engineer of the National Coal Board, retired on Monday. Educated at Repton and Sheffield University, the first world war intervened before Mr. Richardson could begin his career.

After active service in the war, he took up mining engineering and became an articled apprentice in Yorkshire. In 1925 he took the examination for the Inspectorate of Mines and became, at the age of 28, the youngest inspector ever to be appointed.

Mr. Richardson served in the Yorkshire and Northern Divisions of the Inspectorate and in 1935 was transferred to the then Safety in Mines Research Board where he served for three years before being transferred to headquarters in London. It was during this period with SMRB that he was responsible for initiating a nation-wide campaign for the wearing of protective safety equipment and he is particularly associated with the successful introduction of the hard safety helmet which has since become so common an article of pit apparel.

In 1939 he was seconded for special duties, one of which was to act as Principal Priority Officer to the Mines Department, later the Ministry of Fuel and Power, and was in charge of the Mining Supplies Section which was organized to ensure that the mines received their share of essential supplies including safety equipment. He was subsequently appointed to the staff of the Chief Inspector of Mines at the headquarters of the Inspectorate with the rank of Divisional Inspector of Mines.

He joined the National Coal Board on vesting day and in 1948 became chief safety engineer and chairman of the board's Rescue Committee.

Duke Opens Esso Refinery

OVER 99 per cent. of all materials used in the construction of the new Esso refinery on Milford Haven, which was officially opened by the Duke of Edinburgh yesterday (Thursday), was of British manufacture and includes 250,000 tons of steel refinery equipment.

There are four principal refining units and 69 process and storage tanks varying in size up to 54 ft. high and 150 ft. dia. with a total capacity of 189,000,000 gal. The largest tanks have a capacity of more than 5,000,000 gal.

Durham NCB's Prospects

AIMS OF ECONOMY AND HIGHER PRODUCTIVITY

"IN the coming year we must achieve higher productivity and so cut our costs. We must economize in staff and all administrative expenses to the last penny. And we must provide a customer service that will sell our coal on its merits." Dr. W. Reid, chairman of the Durham Divisional Coal Board, made this declaration at a special meeting held last week in Newcastle-upon-Tyne.

The meeting was attended by the divisional board, the divisional consultative council, the Durham County Mining Federation Board, the executive committee of the Durham Area of the National Union of Mineworkers, and the six Area general managers of the division. Dr. Reid outlined the present position in the division and the plan and prospects for 1961.

Some success had been achieved as a result of measures introduced to meet the changed situation of the industry and competition from oil. Comparative figures for the first nine months of the year (with 1959 figures in parentheses) were as follow:—Output, 16,821,000 (17,332,000) tons; disposals, 16,660,000 (15,360,000) tons; stocking, 147,000 (2,032,000) tons; output per manshift, 21.9 (21.3) cwt.; overall accident rate per 100,000 manshifts, 134.31 (144.83). The seamen's strike prevented disposal of over 400,000 tons in the period.

Estimates for 1961

Behind the figures lay a story not only of great effort by management and of full co-operation by the trade unions, but of individual hardship in that 1,700 men were transferred from their own collieries to others to achieve the highest efficiency, Dr. Reid continued.

It was expected that the division would produce some 22,750,000 tons in the current year and an OMS slightly over 22 cwt. per manshift. Total sales would exceed this year's production by over 300,000 tons, in spite of the seamen's strike.

Turning to 1961, the chairman said output was estimated at 22,500,000 tons at an OMS of 23 cwt. Increasing advantage would be received from reconstructed collieries, face mechanization, and from redeployment of manpower—but the division would still have to carry the burden of serious loss from a number of collieries under reconstruction and from others where manpower was being run down prior to closure. There would be further pressure on sales development and it was hoped to lift a further 750,000 tons from stock.

The board's policy of curtailing adult recruitment to craftsmen and to about 1,650 juveniles—as in 1960—would be continued. Four small collieries would be closed and one partially closed during the year. The total manpower involved would be 650, of whom only between 60 and 70 would be redundant. This would bring the number of closures in the division to 15 since 1957, out of a total for the UK of 161.

So far as the future was concerned Dr. Reid thought there might be some loss of gas trade on the Thames to oil as well as the loss of the cement trade to Russian oil in particular. Great efforts were being made to replace this loss with a share in the expansion of the electricity generating market. Durham, too, had a strong claim for the siting in the county of a generating station which could take 3,000,000 tons of coal.

"We are fighting to stem a fall in sales by finding alternative markets, and we are fighting to minimize a fall in average prices by preparing coal to secure the highest prices. The progress in efficiency which we have accomplished is heartening, but we have a long way to go yet," the chairman said. "Productivity must be steadily increased if we are to maintain our place in a highly competitive market.

"If the high standard of co-operation between the board and the trade unions is maintained at all levels we can weather the storm still hovering over us and make 1961 a year of achievement," he declared.

Coal Mining Avoided by School-leavers

OF the 659 boys who left school in the Tamworth, Lichfield, and Rugeley areas of Staffordshire in the 1960 school year, only 17 decided to find jobs in the mines and only one became a mining apprentice.

Commenting on the 10th annual report of the East Central Youth Employment Committee, Miss D. E. Price-Evans, divisional youth employment officer, stated: "Fathers who work in the mines do not want their sons to follow them. A number of new factories have opened in the district and boys prefer to work there. A number of them find better opportunities on the surface." One reason for the fall in recruitment may be the end of National Service: youths are no longer entering the industry to avoid call-up.

Conceding some part of Miss Price-Evans' argument, Mr. P. G. Innel-Clements, public relations officer of the West Midlands Divisional Coal Board, added: "I think the main reason is that pressure for labour is so great in the Midlands area that we are having intense competition from other industries."

OLDEST tin canister used for food, which was taken on the 1824 Northwest Passage expedition, was shown to the Duke of Edinburgh when he visited the Tin Research Institute, at Greenford (Middx), last Friday. The Duke was received by Mr. G. F. A. Burgess, chairman of the International Tin Research Council. Earlier on Friday the Duke of Edinburgh had visited the works of Concrete, Limited, Hounslow.

Law Cases

£6,855 DAMAGES FOR EX-MINER

DAMAGES of £6,855 were awarded against the National Coal Board by a Glasgow jury when John McGuire (47) sued the NCB for £15,000 damages for injuries received when working at Bardykes Colliery, Cambuslang. Mr. McGuire is paralyzed from the waist down following an accident at the colliery in 1956. For the plaintiff, Mr. F. C. Watt, QC, submitted that the accident would never have happened if the NCB had provided a track for miners to walk along and if it had ensured that no trucks were in use when miners were walking through the pit.

Mr. McGuire, who gave evidence from a wheelchair, said he was walking along the track which carried incoming trucks because there was not enough room at the sides. As he tried to avoid trucks coming from behind he became entangled with the haulage mechanism, was thrown, and fractured his spine. He denied suggestions by Mr. J. O. M. Hunter, QC, for the NCB, that he had been riding on the front of the bogey pulling the trucks.

The jury assessed damages at £11,425, but held the plaintiff 40 per cent. to blame for the accident.

AWARD FOR MINER

A TOTAL of £350 was awarded against the National Coal Board at Rotherham County Court to Mr. Christopher Robert James, a miner at Aldwarke Colliery (Yorks). Mr. James slipped on an insecure plate at the junction of two underground roads at the colliery and injured his back.

His counsel, Mr. J. B. Mortimer, said that instructions had been given for the plate, used for turning tubs at the junction, to be lifted when not in use.

FOR taking a match underground at Ogilvie Colliery (Mon), Daniel Morgan (29) was fined £2 at Pontylottyn Magistrates' Court.

FOR A BREACH of the Buildings Safety Regulations the National Coal Board was fined £25 at Stanley (Co. Durham). A joiner carrying out repairs to a NCB house fell 15 ft. when the rung of a ladder broke.

DAMAGES of £2,000 were awarded by Mr. Justice Davis to Mrs. Dora Myers (52), whose husband, Mr. Thomas Myers, a labourer, was killed in an accident at the works of Dorman Long (Steel), Limited. Both parties came to terms out of court, judgment being by consent.

FOR NOT TAKING effective measures to ensure that a crane did not approach within 20 ft. of a place where people were working, Guest, Keen & Nettlefolds (Cwmbran), Limited, was fined £25, with costs, at Caerleon (Mon) Magistrates' Court. The case arose after a welder was trapped by an overhead crane.

FINES of £20 each were imposed by Alfreton Court on two colliery electricians, Peter Beverley Waring (25) and Cedric Arthur Bird (21), for stealing conveyor belting, worth £42 10s. from Brookhill Colliery (Derbyshire). Waring was fined a further £5 for stealing eight metal scaffold clips worth £6, also the property of the NCB.

DAMAGES TOTALLING £4,237 were awarded to Mr. James Bell (44), a chargehand bricklayer, by Mr. Justice Hinchliffe at Durham Assizes against Dorman Long (Steel), Limited, Middlesbrough. Mr. Bell was injured when an iron frame fell on him at the works. Although he had returned to his old job, it was stated that he was unable to do any manual labour.

Coal Mining Must Have More Mechanization

NECESSITY for a rapid advance in mechanization in mining in the British coalfield was stressed by Lord Balfour at a dinner of the Lothians branch of the Association of Mining Electrical and Mechanical Engineers, held to celebrate the jubilee of the association.

Lord Balfour, who is a part-time member of the Scottish Divisional Coal Board and the board's first chairman, is chairman and managing director of Bruntons (Musselburgh), Limited, steel rollers, wire drawers, and wire rope manufacturers. The proportion of power-loading in Scottish pits—38 per cent.—represented not inconsiderable progress—but it was not good enough, he said.

Mining had its risks and the monetary reward of the miner should be at least as good as, if not better than that of any other industrial worker. "If we are to get the coal to maintain the prosperity of this country it has got to be won cheaper (not at the expense of the miners' wages), but by a far more rapid advance in mechanization than there has been in the past 10 to 20 years."

Referring to the great difficulties in conveying electrical power to underground appliances, Lord Balfour said miracles had happened and it might be possible that in the next 50 years some revolutionary method of conveying electrical power underground might be found. It was only by thinking in terms of miracles that most great inventions had been made.

Replying to Lord Balfour, the national president of AMEME, Mr. A. E. Crook, said that the organization had made a great contribution towards the outstanding achievements in the mining industry. It had helped to train, educate, qualify, and provide competent men without whom the mining machines would not have been properly designed and installed.

Holman Bros. Opens New Spanish Factory

NEW factory for Holman-Iberica, SA, was opened last Friday at Pinto, near Madrid, by Mr. P. M. Holman, chairman of Holman Bros., Limited, Camborne (Cornwall). Holman-Iberica was formed in 1957 by Holmans with its Spanish agents, Maclaurin Morrison y Cia, SA, and the Siberex group, principally to overcome stiffening Spanish import regulations.

Initial production was concentrated on air compressors and the first of wholly Spanish manufacture was completed in July last year from drawings and patterns supplied from Camborne. The manufacture of stationary compressors, Holsteels, Holbits, and rock drill spares is already well under way. The new Pinto factory will enable the company to increase both the quantity and range of its products.

CUSTOMS DUTIES for the European Coal and Steel Community for the first half of 1961 have been discussed by the Ministerial Council and agreement reached concerning duties and quotas for the member countries for vanadium pig-iron, titanium pig-iron, electro-plate, rolled wire for the automotive industry, and rolled wire for the production of springs and so-called piano wire.

Park Gate Plans

FOR MOST ADVANCED STEELWORKS IN EUROPE

NEW integrated steelworks, costing between £55,000,000 and £60,000,000 is to be built by the Park Gate Iron & Steel Company, Limited, on a site adjacent to the existing Park Gate Works, near Rotherham. Making this announcement, the parent company, Tube Investments, Limited, stated that the Iron and Steel Board had approved the proposals, which are designed to meet the increasing needs of the TI Group and those of Park Gate's traditional trade. They have also been planned to accommodate future modernization of the existing steelworks in perhaps 10 to 15 years' time.

At a Press conference on Thursday of last week, Mr. C. H. T. Williams, chairman of Park Gate Iron & Steel and a director of TI, said the labour supply position had been examined—the project involves 1,700 extra jobs—and the company had been told that no difficulties should be experienced. The intake of young people for training had already been increased.

MR. C. H. T. WILLIAMS

The new works will use home ore and will initially include ore preparation plant, one blast furnace, a steelmaking department producing steel by the Kaldo process, an electric furnace, and a blooming mill followed by a continuous billet mill. Finishing plant will include a 10-in. continuous rod and bar mill and a continuous narrow strip mill, which will be sited near to the existing 11-in. continuous bar mill installed in 1953.

Work Begins Next Year

Ingot production is estimated at about 425,000 tons a year, which, together with existing output, will make a total ingot production by the company of 875,000 tons a year. All the ingots will be rolled in the new blooming and billet mills, and the semi-finished steel will be finished either on some of the existing mills or on the new finishing mills. There will be some increase in the number of billets available for outside sale.

Work on the new project will start in 1961 and the plant will be commissioned early in 1964. It will come into full operation by 1965 and will be one of the most advanced and economical steelworks in Europe. Main engineering consultants will be the International Construction Company, Limited, and Bylander, Waddell & Partners.

The cost is to be financed by Tube Investments, partly from its own resources and partly by borrowing.

FREDERICK BRABY & COMPANY, LIMITED—Air Commodore J. Warburton has been appointed a director.

British Trade Fair in Moscow Next Year

MORE than 600 companies will participate in the British Trade Fair, which is to be held in Moscow from May 19 to June 4, 1961, under the joint sponsorship of the Association of British Chambers of Commerce and the All-Union Chamber of Commerce of the USSR. The fair will be followed by a Soviet trade and industrial exhibition to be held at Earls Court, London, from July 7 to 29, 1961, under the same joint sponsorship.

Commending the two efforts in London this week, Mr. Reginald Maudling, President of the Board of Trade, said that only about 1 per cent. of UK exports at present went to Russia. The fair in Moscow, therefore, had great potentialities.

The fair is being organized by Industrial & Trade Fairs, Limited, Drury House, Russell Street, London, W.C.2. The Board of Trade is taking part as an exhibitor, but the fair is not being subsidized or underwritten by the Government or by the sponsors.

The site of the fair, to be held in Sokolniki Park, Moscow, occupies an area of about 23 acres. The main categories of exhibits will include plant and machinery (including mining machinery), electrical equipment, scientific instruments, transport vehicles, and engineering equipment. The British Iron and Steel Federation will show a wide range of steel products on a double-decker stand occupying 2,000 sq. ft. of space. The theme of the Board of Trade exhibit will be British achievements in science and technology. The exhibit will occupy some 10,000 sq. ft.

Subsidies for Scrapping Old Ships Called For

SALE of old ships for trading abroad at prices not greatly in excess of scrap values was deplored by Mr. W. T. Garbutt, chairman of the North of England Shipowners' Association, at the association's dinner in Newcastle-upon-Tyne last Friday. He said that he had wished for some time that the iron and steel industry could be encouraged by Government assistance to pay for British-owned tonnage a price commensurate with depressed second-hand values.

Mr. Garbutt told his audience that whether they liked it or not the scrapping of old tonnage was the ultimate solution to their difficulties.

The Scrap Markets

No Lessening of Activity

SCRAPYARDS are still engaged at full strength in meeting the healthy demand from busy blast furnaces, steel melting shops, and foundries. The stress is still on the collection, processing for furnace use, and delivery of maximum tonnages of steelmaking scrap.

Cleveland—Top grade material is eagerly sought. In some cases firms enjoying larger outputs of pig-iron from their own blast-furnace plants are inclined to limit their intake of scrap and to increase the ratio of iron in their furnace mixes, but this is regarded as a purely temporary measure and it does not indicate that there is likely to be a surplus of scrap as a result.

There are plenty of outlets which enable merchants to maintain a steady flow from their stocks, which are by no means excessive, particularly now that the clearance of cast-iron material has been stepped up. Foundries are absorbing more of the lighter cast-iron material and short steel and heavy machinery scrap is in particularly strong demand, as is destructor and baled scrap for blast-furnace use.

Scotland—In Glasgow and the west of Scotland the iron and steel scrap market remains fairly steady and deliveries to the steelworks have been well maintained. The steelworks are eager to receive all available supplies of heavy steel and basic scrap in order to keep pace with incoming orders for new material. Steel turnings are being produced at a fairly steady rate and regular deliveries are being made to the consuming works. The output of cast-iron borings is about average and the blast furnaces are ready to accept all available supplies.

The overall picture in regard to cast iron is slightly brighter, there have been a few inquiries around and some tonnages have been fixed up for the heavier grades of cast iron as well as the lighter grades of cast-iron scrap.

South Wales—The main demand is for heavy and better grade scrap. Merchants in the South Wales area are receiving constant inquiries from the local steelmakers and ironfounders for all the better grade material and are kept very busy bringing in to South Wales all parcels of supplies which are available. Despite constantly increasing output, there appears to be sufficient scrap available.

There is now a reported falling off in the demand for the lighter grade material. This is not so suitable for steelmaking and is used only when the better grade material is unobtainable. The market generally is very active.

Shipyard Safety Regulations

PRESENTED to Parliament on Thursday of last week the Shipbuilding and Shiprepairing Regulations, 1960, come into operation on March 31, 1961, and replace the Shipbuilding Regulations, 1931, which will be revoked. They will bring the 1931 Regulations up to date with methods and conditions of work within the industry, and will introduce some important additional provisions.

The Regulations (SI 1960, No. 1932) are obtainable from the Stationery Office, price 1s. 3d.

Woodall-Duckham Has £20,000,000 Order-book

ORDERS to a total value of £11,000,000 received by the Woodall-Duckham Construction Company, Limited, group, during the first nine months of the year bring the total order-book up to over £20,000,000. The results of the group's policy in broadening its interests are becoming apparent. While the greatest proportion of the orders have been received by Woodall-Duckham Construction for coke-oven and gas-making plants, amounting to £7,500,000, the subsidiary companies have contributed £3,500,000 in a wide range of products.

There are no immediate plans for expansion outside the sphere in which the group already operates.

REPRIEVE FOR THREATENED TUBE MILL

THREATENED closure of the No. 2 rotary forge mill at the Mossend (Lanarkshire) works of Stewarts and Lloyds, Limited. with the resultant redundancy of 1,000 men, has been postponed for a month to early December. The company announced at the beginning of last month that the lack of orders for seamless tubes of up to 9-in. diameter produced at the mill were forcing the closure, but since then a number of new orders has been placed. The company also hopes to secure further firm orders shortly.

The No. 1 mill at the works, employing about 1.000 men, has been working a four-day week since early last month. There is enough work to keep the mill working on this basis until the beginning of 1961, a spokesman said.

Lancashire Foundry Trade

QUIET trading conditions have again been reported in the pig iron section of the Lancashire iron and steel markets. Blast-furnacemen are still experiencing little forward buying of any consequence and with deliveries of most descriptions of iron obtainable at short notice foundries are content to place orders regularly for estimated requirements over relatively short periods ahead.

Among engineering users textile machinists, machine-tool makers, heavy electrical engineers, and chemical plant manufacturers are maintaining a steady rate of operations and between them are accounting for a substantial tonnage of pig-iron, and a fair demand is reported from the jobbing and light foundries. Derbyshire No. 3 iron is quoted for delivery in the Lancashire zone at £21 1s. 3d.. Staffordshire low-phosphorus foundry iron at £23, and West Coast hematite at £25 16s.

HELICAL BAR & ENGINEERING COMPANY, LIMITED—Interim dividend is raised from 2d. to 6d. per 5s. share. A 40 per cent. scrip issue is proposed and the directors forecast a final of not less than 6d. per share on the increased capital. A total of 10d. a share was paid for the year to January 31, 1960. Profits earned in the first six months of the current financial year exceed those of the whole of the previous year and the directors believe the full year's results will show a considerable improvement over 1959-60. The capitalization, involving the issue of 285,419 5s. shares, is applicable to holders registered on November 4.

Obituary

SIR CECIL WEIR

Former Head of British Delegation to ECSC

WIDELY known both in Britain and on the Continent as head of the United Kingdom delegation to the High Authority of the European Coal and Steel Community, from 1952 to 1955, Sir Cecil McAlpine Weir died on Sunday aged 70. His death brings to an end more than half a century of great activity in industry and commerce and, to no less a degree, in service to the State.

Before representing the UK in Luxembourg, Sir Cecil had been a prominent figure in Whitehall and in the Control Commission for Germany. During the last war he served, sometimes concurrently, as Controller-General of Factory and Storage Premises, Director-General of Equipment and Stores, and Business Member of the Industrial and Export Council of the Board of Trade. He then became Economic Adviser to the Control Commission and this was followed by two years as chairman of the Dollar Exports Board.

He was chairman of the British Tabulating Machine Company, Limited, for many years, and of the recently-formed International Computers & Tabulators, Limited, a director of Pyrene, Limited, and British Enka, Limited, and a part-time member of the British Transport Commission.

Sir Cecil was knighted in 1938 for the major part he played in creating the Empire Exhibition in Glasgow.

Mr. TOM ALLAN, managing director of the Leeds Brass Finishing Company, Limited, has died at the age of 76.

The death has occurred of Mr. ARNOLD COBB, a deputy at Darfield Main Colliery (Yorks) for the past 18 years. He was 58.

The death has taken place of Mr. FREDERICK J. KEIGHTLEY, sales accountant for the West Midlands Divisional Coal Board since 1954. Prior to that he was sales accountant and group accountant for the board's North Staffordshire Area. He was 59.

Company secretary of W. H. Allen, Sons & Company, Limited, mechanical, hydraulic and electrical engineers, of Bedford, until he retired, Mr. HAROLD EDWIN BOYD died last week. He was 82. He joined the firm in 1894 when it first started in Bedford.

The death has occurred of Mr. CHARLES FREDERICK JACKSON, a director of Lancashire Dynamo & Crypto, Limited, and general manager of its Willesden factory. He was 56. He served his apprenticeship with the Cox Cavendish Electrical Company, Limited, and joined Crypton Equipment, Limited, in 1936 and Lancashire Dynamo & Crypto in 1941.

The death took place in Paris of Mr. ERIC FREER, a director of the Staveley Iron & Chemical Company, Limited. He had been attending an international conference of the cast-iron pipes industry. He joined the company 40 years ago as a draughtsman and was successively chief draughtsman to the company's technical adviser, works director, and foundries general manager. He became a director two years ago. He was 58. Mr. Freer was a member of the Institution of Mechanical Engineers, the Institute of British Foundrymen, and represented the company on the council of the British Cast Iron Research Association.

The death has occurred at the age of 86 of Mr. JOHN CRAWFORD, who for many years was associated with Stewarts and Lloyds, Limited. Before his retirement 14 years ago, he had been general manager of the Islip furnaces and chief fuel buyer for the Corby works. He had been chairman of Hydroprest Concrete, Limited, Scunthorpe, since its formation in 1930, and its general manager since 1947.

Extended Facilities for Exporters

SPECIAL insurance cover facilities, provided by the Export Credits Guarantee Department for exporters to dollar markets, are to be extended to all exporters. Announcing this when he addressed the annual conference of the Institute of Directors at the Royal Festival Hall, London, on Thursday of last week, Mr. Reginald Maudling, President of the Board of Trade, added that he thought we had "now gone as far as we can in our export credits guarantee," and that the extended facilities, which would be on the lines of the special arrangements made with the Dollar Exports Council, would only apply where there was obviously considerable gain to be made.

Exports constituted the main theme of the presidential address of Lord Chandos, chairman of Associated Electrical Industries, Limited. Making a plea to the directors present to inspire their companies and all others to renewed efforts in the export field, Lord Chandos said that "export or die" was very true; Britons as a whole could not continue to "have it so good" unless they exported more.

The sound barrier to increased exports was undeniably the cost and risk of breaking into an export market, said Lord Chandos. Whereas a big company could incur two or three years' losses in breaking in, the smaller companies could not afford that.

ON THE RECOMMENDATION of the coroner, the jury at the inquest on the death of Mr. William Charles Piper (52), a fitter who was killed at the Newport (Mon) steelworks of Stewarts and Lloyds, Limited, returned a verdict of Accidental Death. Mr. Piper was killed when a steel press which he was servicing was set in motion.

Board Changes

Mr. E. J. Hunter Joins Consett Iron

CONSETT IRON COMPANY, LIMITED, has appointed Mr. Ernest J. Hunter as a director. He is chairman of Swan, Hunter, & Wigham Richardson, Limited, shipbuilders, etc., of Wallsend-on-Tyne.

Mr. Hunter is well-known in shipbuilding circles and is a driector of the British Shipbuilding Research Association. In May of this year he was elected senior vice-chairman of the Dry Dock Owners' and Repairers' Central Council. Among the companies of which he is a director are Barclay Curle & Company, Limited, the Glasgow Iron & Steel Company, Limited, and the Wallsend Slipway & Engineering Company, Limited. In the Birthday Honours this year Mr. Hunter was made OBE.

CRANES (DEREHAM), LIMITED—Mr. K. D. Vick, London manager, has joined the board.

ELGAR MACHINE TOOL COMPANY, LIMITED—Mr. J. J. Fashey and Mr. A. J. Cann have been appointed to the board.

REED BROS. (ENGINEERING), LIMITED—Col. J. H. Anderson has been appointed chairman of the company and of the subsidiary, Terra Force (Great Britain), Limited.

DOUGLAS (SALES & SERVICE), LIMITED—Mr. Brian C. Owen and Mr. Eric F. Brockway have been appointed to the board of the company, a division of the Westinghouse Brake & Signal Company, Limited.

FIRTH CLEVELAND TOOLS, LIMITED—Mr. J. C. Abberley has been appointed director in charge of the Tipton works and Mr. A. H. McIlreath, director in charge of the Wolverhampton factories. Mr. J. Abberley has retired from the board.

B. & B. TRAILERS, LIMITED—Following the acquisition of the company by Wright's Ropes, Limited, the chairman of that company, Mr. G. J. W. Turner, has joined the board. Mr. G. W. Percival and Mr. R. E. Wheatcroft have also been elected directors.

LLANELLY STEEL COMPANY, LIMITED—Mr. K. M. Jones, a director of Briton Ferry Steel Company, Limited, and Baglan Engineering Company, Limited, has been appointed chairman in place of Mr. H. Stewart Craig, who has retired. Mr. M. S. Vaughan, a director of Duport, Limited, the parent company, and of Briton Ferry Steel, has joined the board.

BROOKE TOOL AUTOMATION, LIMITED—Mr. E. W. B. Owen, a director of the parent company, Brooke Tool Manufacturing Company, Limited, and Mr. E. W. Hancock have joined the board. Mr. Harry H. Evans and Mr. K. G. Walton have been appointed a director and production manager and a director and general manager, respectively.

HARRY FERGUSON HOLDINGS, LIMITED—Mrs. M. A. Ferguson has been appointed chairman in succession to the late Mr. Harry Ferguson. Mr. A. J. Sheldon has been elected chairman of Harry Ferguson Research, Limited, and Major A. R. P. Rolt becomes managing director. Mr. J. R. Peacock, secretary of both companies, has been appointed to both boards. Count P. M. Giri de Teramala, pioneer of the application of the torque converter principle to road vehicles, and Mr. C. Hill chief engineer of Harry Ferguson Research, have both joined the board of that company.

Steady Drain on Coal Stocks

COAL consumption at nearly 4,100,000 tons a week is well above total output, which remains fairly steady at about 3,900,000 tons. Naturally the effect on stocks has now become more pronounced. For the week ended October 22, undistributed stocks were down to 33,314,000 tons, compared with 35,055,000 tons a year ago. This is the first time undistributed stocks have been down to this figure since the beginning of May. Distributed stocks also show a welcome increase to 14,600,000 tons.

There were 586,500 wage-earners on colliery books on October 22, against 641,400 on October 24, 1959, the numbers engaged at the coal face being 221,600 and 248,000 respectively. Total absenteeism (all workers) in the week ended October 22 was 14.60 per cent. compared with 14.34 per cent. in the week ended October 24, 1959. Output at the face was 4.064 tons and overall 1.426 in the week ended October 22, compared with 3.810 and 1.368 tons in the week ended October 24.

The following table gives (in tons) the output of saleable mined coal by division in the week ended October 29, and the tonnage lost through all causes (holidays, disputes, and go-slows):—

Division.	Week ended October 29, 1960.		Week ended October 31, 1959.
	Total output.	Tonnage lost.	Total output.
Scottish	355,300	6,800	378,300
Northern (N&C) ..	248,500	100	252,000
Durham	463,900	500	473,900
North-Eastern ..	818,900	18,900	826,900
North-Western ..	261,200	500	284,600
East Midlands ..	891,300	—	897,000
West Midlands ..	273,900	400	305,600
South-Western ..	385,400	7,400	410,500
South-Eastern ..	28,800	—	34,300
Great Britain—			
Deep-mined coal ..	3,727,200	34,600	3,863,100
Other deep-mined (including licensed mines) ..	39,900	—	58,900
Open-cast coal ..	110,500	—	171,000
TOTAL	3,877,600	34,600	4,093,000

Six-man Coal Face in 10 Years Forecast

"IN five or 10 years time most coal faces will be operated fully by mechanical means and coal will be produced from a face by two electricians, two mechanics, and two labourers." This picture of the future coal mine was given to apprentices by Mr. T. Wright, manager of the No. 5 Area of the East Midlands Divisional Coal Board, at a presentation of certificates recently.

The NCB realized the importance of the engineer and there would be discussions with the unions on complaints about rates of pay, he said. He said that some of the finest mining techniques in the world were used in the division and that by 1970 its annual output was expected to increase by 10,000,000 tons to 53,000,000 tons.

GKN PROPOSAL

£22,600,000 to be Raised by Rights Issue

DECIDING that it would be unwise to delay the introduction of new finance and as it is not its policy to come frequently to the market, the board of Guest, Keen & Nettlefolds, Limited, proposes to raise a large sum now which it is hoped will be sufficient to carry through the next few years. A one-for-six rights issue of 6,582,011 new ordinary shares at 70s. per £1 share—payable 30s. on or before December 15 and the balance by February 1, is to be offered to holders. Net proceeds will amount to about £22,600,000.

The board states that the group's annual rate of capital expenditure is unlikely, during at least the next three years, to fall below the 1959 level of £18,000,000. While profits retained, including depreciation, in 1959, provided over £17,000,000 towards this expenditure, liquid resources fell during that year by about £5,000,000 to £15,000,000 owing to the pressure of increased turnover on working capital.

Continued expansion and consequent necessity for increased working capital, may be expected to result in the liquid resources being increasingly depleted as plans mature. Immediate advantage can only be taken of new opportunities for investment and expansion which arise from time to time if adequate financial resources are in hand.

Prospects for 1960

The interim dividend is maintained at 5 per cent. from trading profits of 1960 and, in addition, a special non-recurring dividend of 2½ per cent., not subject to tax, is declared from profits realized during 1960 by a continuance of the policy of reducing the portfolio of investments. It is intended to recommend a final of 10 per cent. (same) payable on the increased capital.

The directors state that it seems probable from information now available that the surplus for 1960 before tax, excluding the special surplus on sale of investments and other exceptional items, will not be less than £29,000,000, compared with £25,800,000 in 1959. The increase, however, arises largely from the exceptionally high rate of activity at most of the works and it would not be reasonable to expect this level to be maintained.

On the other hand the benefit should be obtained progressively during the next few years from the various schemes of modernization and expansion coming into profitable operation.

SERCK, LIMITED, holding company for tubemakers, engineers, etc., of Birmingham—The chairman, Mr. W. H. Newton, states that new major ventures are unlikely as yet to make any large contribution to profits, but the expenses of their development should decrease. Despite a significant increase in group turnover, profit, before tax, dropped to £1,073,038 (£1,273,885), largely owing to a shrinkage in profit margins. A final dividend of 7½ per cent. makes 12½ per cent. for the year, compared with 11¼ per cent., the equivalent on the new capital of last year's 17½ per cent.

Eastwoods' Record-breaking Year

RECORDS of production and sales were established throughout the organization and the trading profit of nearly £1,500,000 was far in excess of anything previously achieved, states Lt.-Col. Sir Thomas Moore, chairman of Eastwoods, Limited, brickmakers, cement manufacturers, etc., of London, E.C.1, in his annual review.

Another milestone was passed when for the first time the profit after charging depreciation and amortization, slightly exceeded the £1,000,000-mark. The net profit of £501,000 shows a substantial increase of over £200,000 compared with the previous year.

A final dividend of 12½ per cent. makes a total of 17½ per cent. for the year, an increase of 2½ per cent. on the previous period.

British Aluminium Looks Ahead

SALES during the past year established a record by a substantial margin, states Lord Plowden, chairman of the British Aluminium Company, Limited, in his annual review. Conditions were, however, becoming increasingly competitive and keen selling and marketing would be necessary if the company was to continue to make progress. It was, therefore, continuing to concentrate on the development of new products and applications for the future.

It was expected that in the relatively near future the assets of Reynolds T.I. Aluminium, Limited, and British Aluminium would be merged formally. During the year considerable reorganization of the management of the company and of its group interests had been carried out.

Lord Plowden believes that the demand for aluminium, particularly in the UK, will increase substantially during the next five to 10 years, and future policy regarding expansion of aluminium production and fabrication, both at home and oversea, kept constantly in mind. Considerable expenditure had already been authorized for development and expansion and further proposals were under review.

FROM NOVEMBER 1, Barrow Ironworks, Limited, is to be represented throughout the Birmingham area and the whole of the south of England for the sale of hematite and semi-phosphorus pig-irons, by Leopold Lazarus, Limited, London and Birmingham.

Orders Placed

Gas Cleaning Plant for Appleby-Frodingham

FOLLOWING a £1,500,000 contract from the Appleby-Frodingham Steel Company, branch of the United Steel Companies, Limited, last month for sinter machines, Head Wrightson Iron & Steel Works Engineering, Limited, a subsidiary of Head, Wrightson & Company, Limited, has now been given an order for a gas cleaning plant capable of cleaning 8,100,000 cu. ft. per hour of blast-furnace gas.

The plant will consist of two 18 ft. diameter washers and four 23-ft. 6-in. diameter precipitators together with ancillary equipment and instrumentation. The value of the plant is over £450,000.

TWO HIGH-SPEED forging presses of 800 tons and 600 tons capacity are to be built by the Loewy Engineering Company, Limited, Bournemouth, for Thos. Firth & John Brown, Limited, Sheffield. The presses are oil driven and are fitted with auto-planishing and positional control gear.

CONSTRUCTION of ground foundations for the steelworks extensions at the Ravenscraig Works of Colvilles, Limited, is to be undertaken by the Tarmac, Limited, group, Wolverhampton. The contract, which includes the foundations for two blast furnaces, is worth about £500,000.

THROUGH its South African representative—Fraser & Chalmers (SA) (Pty.), Limited—G. & J. Weir, Limited, Glasgow, has received an order from the water affairs branch, South-West African Administration, for a Weir "Multiflash" sea-water distillation plant. It will produce 120,120 gallons of fresh water daily.

OVERSEA CONTRACTS which, the firm states, will help to consolidate its employment position for some time ahead are announced by A. Reyrolle & Company, Limited, manufacturing electrical engineers, of Hebburn (Co. Durham). The contracts are for equipment for New South Wales (Australia), Tasmania, and South Africa.

ORDER valued at about £270,000 for the supply of 10.8 miles of 30-in. and 36-in. diameter prestressed concrete pressure pipes for the Bristol Waterworks Company's Sharpness abstraction scheme has been awarded to the Stanton Ironworks Company, Limited. The pipes will form the first section of a 17-mile-long main from Purton to the new Severnside works of Imperial Chemical Industries, Limited.

CONVERSION of an underground winder in the Withok gold mine of the S.A. Rands & Exploration Company, Limited, from steam to electricity is to be undertaken by the General Electric Company, Limited. Twin 6.6 kV., 1,150-h.p. 10-pole a.c. motors will be used to drive the 12 ft. by 5 ft. double-drum winder which will be fitted with GEC's latest closed loop a.c. speed-control system. The contract is worth £50,000 and includes switch and control gear.

"SEVERAL MILLION POUNDS" is the estimate put on orders received by Humphreys & Glasgow, Limited, consulting and contracting gas engineers, of London, S.W.1, from India, Central America, and Australia. The Indian contract, which alone is understood to be worth "several million pounds," is for the design and construction of a chemical plant. In Central America the company will be working on a new tetra-ethyl-lead plant, where "anti-knock" compounds will be produced. The City of Melbourne has placed a £A1,000,000 order, but what is involved in the contract has not been disclosed.

COYNE METHOD of cable anchorage—new to this country—is to be used by the Cementation Company, Limited, to carry out a contract for the Falmouth Borough Council to raise the height of the Argal Dam by 11 ft. The dam will be raised in two lifts and when the first has been completed high-tensile steel cables will be inserted into holes drilled in the dam, anchored to the bed rock, and stressed to a working load of 200 tons. The stressed heads of the cables will then be incorporated in the second lift. The contract is worth £61,000.

CONTRACTS totalling about £5,500,000 for 50 main-line diesel locomotives and 98 sets of engines and transmissions to equip diesel shunting-locomotives have been concluded by the British Transport Commission. The main-line locomotives will be supplied by Beyer, Peacock & Company, Limited, and will have 1,700-h.p. diesel engines and hydraulic transmissions. Power equipment sets have been ordered from the English Electric Company, Limited, and comprise 350-h.p. diesel engines and electric transmissions in which the engine is coupled to an electric generator.

A £50,000 CONTRACT for the supply and installation of overhead cranes has been placed with the Wharton Crane & Hoist Company, Limited, Reddish, Stockport, by James Booth Aluminium, Limited. The equipment will be installed next year in the company's Kitts Green Works, Birmingham, which is now being modernized and re-equipped as part of a £5,000,000 expansion programme. The contract includes a 110-ton capacity, four-motor cage-controlled overhead electric travelling crane, with a span of 62 ft. 10 in., which is fitted with a 5-ton auxiliary hoist, a 5-ton enclosed type crane, on a span of 49 ft., fitted with a telescopic mast and electric slewing gear, with automatic tongs for handling aluminium ingots, and a 30-ton, two-point lift, three motor, crane on a span of 91 ft. 3 in.

Import Duty on Flake Graphite and Anhydrous Borax

ON the recommendation of the Board of Trade, the Treasury has made the Import Duties (General) (No. 11) Order, 1960 (SI, 1960, No. 1970) removing the import duty on certain flake graphite and anhydrous borax.

The order, which came into operation on Wednesday, affects flake graphite used in the production of crucibles for metal smelting and is defined as: "Natural graphite, crystalline, in flakes and containing not less than 85 per cent. of carbon, being graphite such that if a cylindrical container with an internal diameter of 2 in. and a depth of $1\frac{5}{8}$ in. is filled by funnelling the graphite through a circular orifice of $\frac{1}{4}$ in. diameter placed centrally $2\frac{1}{4}$ in. above the top of the container, the contents of the container will have a density of less than 60 grammes per 100 cubic centimetres."

Relief of import duty on anhydrous borax relates only to "di-sodium tetraborate, such that, reduced to the dry anhydrous form, it would be of a purity not less than 99 per cent. anhydrous." The import duty on certain hydrated borax remains at 20 per cent.

FIRTH CLEVELAND, LIMITED—Interim dividend is raised to 12 (10) per cent. Last year's final dividend was a record $17\frac{1}{2}$ per cent.

In Parliament

LLANELLY STEEL COMPANY

Labour Member Criticizes Price Paid

PROMISED criticism of the disposal of the Llanelly Steel Company (1907), Limited, to Duport, Limited, came on Thursday of last week, just before Parliament was prorogued. The replies of Mr. Anthony Barber, Economic Secretary to the Treasury, did not satisfy MR. JAMES GRIFFITHS (Lab.), who said that because of the public importance of the matter and the fact that the House was entitled to a full account of how the public came to lose £1,500,000 over the sale, he proposed to raise the matter on the Adjournment.

When MR. BARBER said that in view of the company's revenue position in recent years he was satisfied that the price paid—£1,750,000—was adequate, MR. GRIFFITHS retorted that that meant £1,500,000 of public money had gone down the drain. Was that the best offer the Government had had?

The Duport offer was the only firm one received by the Iron and Steel Holding and Realization Agency, MR. BARBER replied. What a company was worth—apart from its break-up value—was governed by what it could earn. Over recent years the average profit after depreciation and before interest and taxation of Llanelly Steel was only just over £19,000 and in both 1958 and 1959 it made losses of £176,000 and £53,000.

The suggestion by Mr. George Mitchison (Lab.) that there was a general opinion that public assets were being sold at a loss simply to get rid of them was described by the ECONOMIC SECRETARY as "absolute nonsense." If the price which was agreed in respect of the sale had not been adequate he would have thought that they would have had at least one firm offer in excess of it during the seven years since 1953.

GRANT FOR TURBINE RESEARCH

WHAT grant was made in the current year and what grant was proposed in the next financial year to Parsons & Marine Engineering Turbine Research and Development Association? MR. AUSTEN ALBU (Lab.) asked. Was the Minister absolutely certain that the rules of this organization allowed the full play of technical and economic competition?

For the Minister for Science, SIR DAVID ECCLES, Minister of Education, said the grant in the current financial year would amount to £70,000 in consideration of the fact that industry would have raised £210,000. The grant for next year would be on the same terms. The DSIR was to review the terms of the grant as part of the investigation it was making into research and development work in the industry.

QUESTIONS ON THE DISPOSAL of Richard Thomas & Baldwins, Limited, were wound up by the Chancellor of the Exchequer who said (above Opposition cries of protest): "It is our intention to sell the company. We have never concealed the fact. We have said at election after election that we intend to return this industry to private enterprise. When it goes back to private enterprise I, as Chancellor, will still have an interest in it of over 50 per cent."

THE Committee on the Management and Control of Research and Development hoped to complete its report early in the New Year, the Minister of Education (for the Minister for Science) told Mr. Austen Albu (Lab.).

ASKED BY Mr. Austen Albu (Lab.) whether it had been decided to publish the Department of Scientific and Industrial Research's report on shipbuilding, the Minister of Education (for the Minister of Science) said the object of the report was to propose action to make the industry more efficient. Publication must therefore be considered in the light of discussion with the industry on future action. The DSIR, however, intended to publish a statement as soon as discussions with the industry were concluded.

Bright Future for Toledo Woodhead

MOST gratifying change in the prospects of Toledo Woodhead (Springs), Limited, Sheffield, took place over the past year, states the chairman, Mr. Frank Woodhead. Due largely to a substantial rise in turnover, the group trading profit of £170,487 in 1959-60 showed a 70 per cent. improvement over the previous year's result. With pending trade negotiations and developments taking place in the group's production facilities, the board is confident that immediate prospects are "very good indeed."

A rights issue of one new 4s. share for every two held, at 10s. 6d. each, is to be made to holders registered on November 10. Shares not taken up will be sold at a premium above the issue price and the net profits distributed *pro rata* among members to whom they were provisionally allotted. Expansion plans make it necessary to raise approximately £225,000 and it is proposed to increase the authorized capital to £500,000 by the creation of 1,500,000 4s. shares. After the rights issue the remaining 1,150,000 shares will be retained.

J. C. BAMFORD (EXCAVATORS), LIMITED—Mr. J. Skeldon, sales manager, has been appointed sales director.

Rare Corrosion Caused Fatal Explosion

EXPLOSION in a boiler at the National Coal Board's Smithywood coke ovens, Sheffield, which killed an attendant, was caused by a rare case of "intermittent wetting" which corroded the boiler tubes. This was stated at the Grenoside inquest on Mr. Herbert Bramwell (38). Mr. George W. Bradshaw, who was working with Mr. Bramwell when the accident happened, said that just before the explosion occurred the pressure gauges registered the normal 220 lb. pressure.

The plant engineer, Mr. Hugh Roberts, said that the boiler was last officially inspected in July. The safety valve was set to blow off at 250 lb. pressure, but in this case it had not blown so there could not have been excessive pressure. It was unique in his experience for a tube to split in this way. Later Mr. Roberts said that the NCB proposed removing all the tubes in all three boilers and replacing them with new ones.

Mr. J. Elwell, a metallurgist with Sheffield Testing Works, Limited, said the thickness of the split tube was found to vary considerably and the fracture had occurred where the wall was of reduced thickness. The tube had a tensile strength of 26.4 tons, well over BSI requirements. It was a rare case of "intermittent wetting" causing corrosion in a limited area which could not be found without cutting open the tube.

SCOTLAND'S GREAT INDUSTRIAL PROBLEM

HOPE of higher productivity and greater prosperity for Scottish industry is still being hampered by the fear of insecurity and unemployment. This statement was made by Mr. Alan Beaton, a management consultant, speaking at a meeting of the Work Study Society and the Institute of Industrial Technicians in Glasgow recently.

Mr. Beaton pointed out that Scotland has twice the average unemployment rate of the UK and the real income per head is estimated at 10 per cent. lower than the national average. Wages for comparable jobs were as much as 25 per cent. less than those obtainable south of the border. He suggested that a completely new look at labour relations in Scotland was urgently needed.

World "Copyright" Wanted for Industrial Designs

IMPORTANCE of giving protection to industrial designs in the same way as copyright works was emphasized by Mr. Niall Macpherson, Parliamentary Secretary to the Board of Trade, when the joint meetings of the International Copyright Committees began in London on Saturday.

In these days when goods flowed more freely over frontiers, he said, it was becoming more and more important that there should be this protection in a number of countries without the necessity for making separate applications in each one.

EXPLOSION in the Ponki coalmine, near Kushiro, on Hokkaido Island, Japan, on Sunday, killed 15 miners.

Choice for Associated Belting Shareholders

OFFER from Investment & General Management Services, Limited, to acquire the capital at 10s. for each 7½ per cent. cumulative preference 10s. share and 9s. 5d. for each 10s. ordinary share has been received by Associated Belting Companies, Limited, Cardiff.

The offer was received by the board after making its 1959-60 report and constitutes an alternative to the voluntary liquidation proposed in the report.

The directors, who have agreed to accept the offer in respect of their own holdings, state that it is clear that there is unlikely to be very much difference between the amounts offered and the amounts receivable in liquidation (10s. per preference and not less than 9s. per ordinary share). They recommend holders also to accept, since it should result in payment being received at an earlier date than in liquidation.

The group incurred a trading loss of £2.294 for the year to March 31, 1960, against a loss of £14,962. The preference dividend is in arrear from July 1, 1956, to March 31, 1960, the gross amount being £40,781.

AUSTRIAN STEEL OUTPUT RISES

OVER the first nine months of the current year, Austrian steelworks produced a total of 2,360,000 metric tons, compared with 1,820,000 tons for the same period of last year and 2,510,000 tons for the whole of last year. Raw steel output in 1960 is expected to exceed 3,000,000 tons and pig-iron output 2,000,000 tons, compared with 1,840,000 tons in 1959.

Rolled steel production in Austria for the nine-month period of 1960 was 1,550,000 (1,250,000) tons. Last year 1,740,000 tons were produced. Exports of rolled steel to the end of September amounted to 800,000 tons, compared with 663,000 tons in the same period of 1959 and 919,000 tons for the whole year.

Over the first three quarters of 1960 4,535,900 tons of coal was mined in the country, 2 per cent. less than the total of 4,637,300 tons produced in the corresponding period of 1959. In September 512,000 tons were mined compared with 544,000 tons in September, 1959.

Baker Perkins Acquires Alfred Porter Group

PETERBOROUGH manufacturing engineers, iron, steel, and brass founders, etc., Baker Perkins, Limited, has signed an agreement to acquire Alfred Porter & Company, Limited, and affiliated companies, of Teddington (Middx). The purchase price is £250,000 for all the issued share capital of the four Alfred Porter companies.

The operations of the Porter companies will be integrated with a subsidiary of Baker Perkins, William Douglas & Sons (Engineering), Limited. Mr. G. F. A. Crook, managing director of Alfred Porter, will join the board of William Douglas.

SITE near Caernarvon for a factory which will initially employ 500 and ultimately perhaps 1,000 is being bought by Ferodo, Limited.

MR. R. G. C. COWE

MR. R. G. C. COWE

APPOINTED secretary of the National Coal Board at the beginning of the year, Mr. Robert George Collin Cowe joined the industry in the early days of nationalization. Originally, he intended to join the Indian Civil Service, but constitutional changes in India prevented the appointment. His first NCB post was in the chairman's office at national headquarters, and he became personal assistant to Lord Hyndley and later to Sir Hubert Houldsworth. In February, 1952, he moved to the East Midlands Division as secretary of the board there, and three years later he was appointed staff director of the North-Eastern Division. He returned to headquarters as deputy secretary of the board in October, 1958.

Mr. Cowe was born in 1917, and educated at Duke's School, Alnwick, Berwick-on-Tweed Grammar School, and Edinburgh University. From 1939-46 he was in HM Forces, and served in North Africa and Italy, being demobilized as a Major in the Royal Artillery.

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SOLID STOWING ON A MECHANIZED FACE AT *Wharncliffe Silkstone Colliery*

By E. E. CRANKSHAW*

Solid stowing in No. 5 (South Barnsley) Area of the North-Eastern Divisional Coal Board has received prominence owing to the necessity to work pillars of high-quality coal under heavily built-up areas. In this paper, presented to the Yorkshire Branch of the National Association of Colliery Managers on February 9, 1960, the author describes a system of pneumatic stowing on a mechanized face. In order to increase the length of stowing completed in a shift, a trial length of self-advancing supports was installed. This reduced the preparation time from 18 min. to 3 min. for an 18-ft. length of stowing.

DECLINING coal reserves on the western outcrop of the Yorkshire coalfield and the consequent deterioration of coal qualities are compelling the mining engineer to turn his attention to the large expanses of good quality coal which have lain sterile under the built-up areas since the early days of mining. Economical means have to be found whereby these relatively shallow seams can be worked with the minimum of disturbance to surface property and solid pneumatic stowing appears to be the one method by which this may be most successfully achieved.

In the past, the chief drawbacks to pneumatic stowing have been lack of suitable access roads for transport of the dirt underground, difficulty in recovering and handling dirt at the surface, transport costs underground, and costly machinery.

The object of this paper is to outline:— (*a*) A method of transporting underground run-of-mine dirt and dirt recovered from spoil heaps; (*b*) a practical means by which dirt can be successfully and economically stowed on a large mechanized face.

Location and History

Wharncliffe Silkstone Colliery is situated five miles south of Barnsley. The three shafts, which were put down in the year 1853, are now used solely for ventilation and pumping purposes. Coal is conveyed from the Fenton Seam horizon direct to the screening plant via a short surface drift. At a point 1,000 yd. inbye of the drift bottom, a downthrow fault brings the Fenton and Flockton seams almost opposite. During 1954, a surface drift having a gradient of 1 in 1 was put down inbye of the fault to the Flockton Seam to facilitate the conveyance of dirt for slusher stowing.

In 1957, the only reserves of coal left to be worked in the Flockton Seam were either of very inferior quality or pillars of coal left supporting surface property. At this period it was necessary to improve the quality of the product, and it was decided to extract, from under an extensively built-up area, a panel of coal 310 yd. wide and 600 yd. long, section 3 ft. 4 in. (including a 4-in. dirt band) at a depth of 110-120 yd. Fig. 1 shows the layout of the panel.

* Group manager, No. 5 Area, North-Eastern Divisional Coal Board.

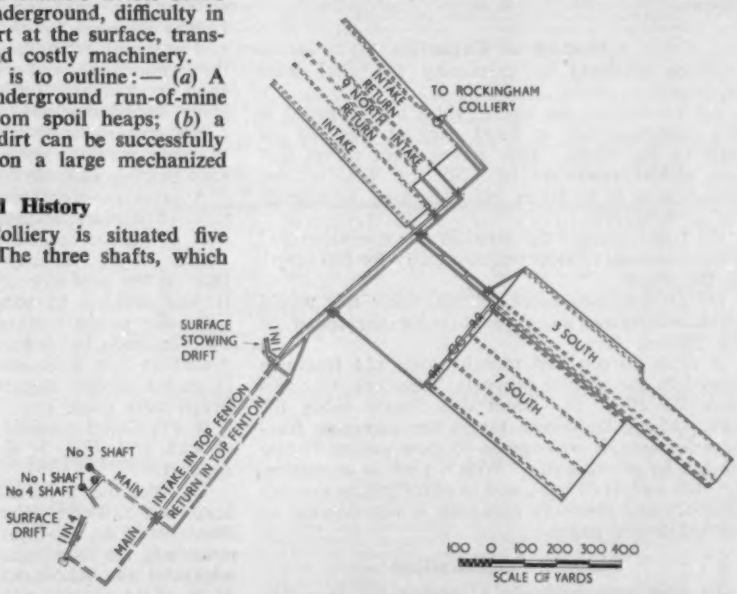

FIG. 1.—LAYOUT AND LOCATION OF THE STOWING PANEL, 9's NORTH.

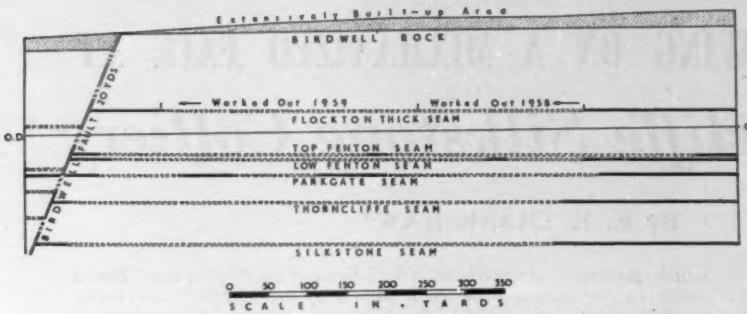

FIG. 2.—NATURAL SECTION ON LINE OF ADVANCE OF THE FACE IN THE FLOCKTON SEAM.

At the surface, above the proposed working, a 30-ft. thick bed of sandstone outcropped. Below the Flockton Seam five seams had been worked in fairly close proximity in the previous 60 years, leaving a variety of ribs in all seams. The working of these five seams represented an extraction of approximately 22 ft. and it was realized that the sandstone bed must be badly fractured. Details of these old workings, which are shown in Fig. 2, are given in Table 1.

TABLE 1.—*Details of Worked-out Seams at Wharncliffe Silkstone Colliery.*

Seam.	Worked section.	Depth.
	ft. in.	yd.
Top Fenton	3 5	177
Low Fenton	4 2	180
Parkgate	5 3	200
Thorncliffe	4 6	233
Silkstone	4 9	290

Method of Extraction

Three methods of extracting the coal were suggested at Area level:—

(1) To extract the whole width of the panel in one operation and to hand pack at least 70 per cent. of the waste. This arrangement meant that five arched roadways of 12-ft. by 9-ft. section, would have to be taken with the panel, to provide the packing dirt.

(2) Extraction of the panel in one operation and simultaneously to stow pneumatically the full length of the waste.

(3) To take two faces 150 yd. wide; this would mean advancing the face at twice the speed of the 300-yd. face.

A close survey had revealed that old fractures existed in the surface property; therefore, to minimize the effect of violent disturbance along the planes of weakness and to prevent any new fractures forming, it was agreed to stow pneumatically the full length of waste. With a view to increasing the bulk output of coal, and to effect greater overall efficiency and therefore economy, it was decided to mechanize the panel.

Planning Considerations

To stow pneumatically a mechanized face 310 yd. in length required careful initial planning. The first consideration was the number of roadways to be taken with the panel. Previous experience in the Area had proved that the maximum distance inbye of the stowing machine for dirt to be taken through 6-in. dia. pipes, including bends, was in the region of 180 yd. In view of this, and taking into account the ventilation of the panel, it was decided to take five gates.

With mechanization, the objective was to have and maintain a sufficient margin of ventilation to provide for any unknown changes, *i.e.*, any sudden gas emission or drop in the barometer.

In the early stages it was realized, owing to the working of a mechanized unit 300 yd. in length and a conventional face 200 yd. in length to the south of the main roads and adjacent to the new panel, that the planned standards of ventilation would not be achieved.

To overcome this problem, the stowing drift previously referred to was made into an additional intake, by driving a short drift from the present intake roadway.

Choice of Support

Great care was exercised with the choice of support to be used and also with the Support Rules. It was essential to obtain maximum productivity and economy from the unit in question; therefore, the withdrawal and subsequent erection of the supports had at all times to keep pace with the travel of the machine.

For pneumatic stowing the supports had to be portable, readily adjustable, and possess high initial load-bearing characteristics.

A prop-free-front system of support was necessary. Therefore, a certain amount of unsupported roof had to be catered for; hence, it was desirable to have a high density of support throughout the face on the goaf side of the conveyor at all times. It was decided to support the face by Dobson hydraulic props and corrugated bars 6 ft. long by 5 in. wide by $\frac{5}{16}$ in. thick, weighing 50 lb. and placed at 3-ft. 6-in. centres. In the stable holes, H-section girders supported by Dobson hydraulic props were used.

It was found possible to eliminate the setting of chocks and Fig. 3 shows the method of face support.

The flexible armoured conveyor had double head and tail-end drives. A BJ-D disc shearer fitted with an 80-h.p. water-cooled motor was mounted on the conveyor. Hydraulic rams advanced the whole structure to the face. The drum of the shearer was 40 in. dia. and 27 in. wide and was of Heeley design, with eight flutings and

extra pick boxes fitted at the face side. This type of drum gave extra speed to the machine and reduced the make of fine coal.

The objective was to advance the face at least 4 ft. 6 in. in 24 hr., and, as 70 per cent. of the face had to be stowed, this was equivalent to 9,765 cu. ft., or 651 tons, of dirt in 24 hr. This dirt tonnage was in excess of the coal tonnage expected from the face, and it was essential to provide a reliable conveyor system, both underground and on the surface, to carry a continuous supply of dirt inbye.

Assessment of the Dirt Tonnage

Prior to the installation of the stowing scheme, the total quantity of dirt produced from all sources underground was carefully assessed over a one-month period. It was the custom for all screen and mine repair dirt to be loaded into wagons, which were transported 900 yd. by locomotive to the dirt stack and emptied by hand. No difficulty was experienced in arriving at the dirt tonnage, as the wagons passed over the landsale weighbridge.

In assessing the washery dirt, the difference between the pithead tonnage and the saleable tonnage was taken each day. The assessment revealed that the average daily amount of washery dirt was 240 tons, screen dirt 31 tons, and mine repair dirt 52 tons. Washery dirt was taken to the summit of the dirt stack by conveyors and spread periodically by a bulldozer.

Table 2 shows the personnel and cost/ton during 24 hr., of handling the dirt based on a saleable output of 1,000 ton/day. The surface labour cost per ton of dirt handled was 1s. 1d. per ton.

Surface Arrangements for Pneumatic Stowing

Washery dirt having a moisture content of 12 per cent. along with screen and mine dirt was taken by conveyors to the summit of the dirt stack and deposited in a 10-ton balance hopper (Fig. 4).

From this hopper, dirt was fed on to a shaker chute, which delivered an even and constant

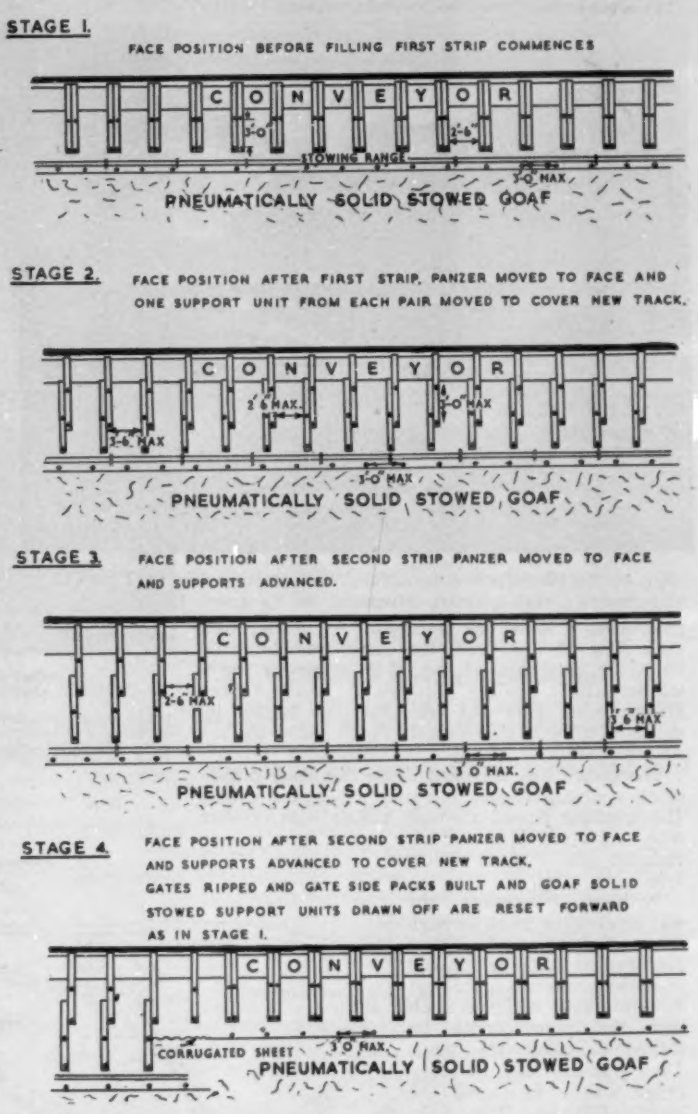
STAGE 1.
FACE POSITION BEFORE FILLING FIRST STRIP COMMENCES
CONVEYOR
3'-0"
STOWING RANGE
2'-6"
3'-0" MAX.
PNEUMATICALLY SOLID STOWED GOAF
STAGE 2.
FACE POSITION AFTER FIRST STRIP, PANZER MOVED TO FACE AND ONE SUPPORT UNIT FROM EACH PAIR MOVED TO COVER NEW TRACK.
CONVEYOR
2'6 MAX.
3'-0 MAX
3'-6" MAX
3'-0" MAX.
PNEUMATICALLY SOLID STOWED GOAF
STAGE 3.
FACE POSITION AFTER SECOND STRIP PANZER MOVED TO FACE AND SUPPORTS ADVANCED.
CONVEYOR
2'-6 MAX
3'-6 MAX
3'-0" MAX.
PNEUMATICALLY SOLID STOWED GOAF
STAGE 4.
FACE POSITION AFTER SECOND STRIP PANZER MOVED TO FACE AND SUPPORTS ADVANCED TO COVER NEW TRACK.
GATES RIPPED AND GATE SIDE PACKS BUILT AND GOAF SOLID STOWED SUPPORT UNITS DRAWN OFF ARE RESET FORWARD AS IN STAGE 1.
CONVEYOR
CORRUGATED SHEET
3'-0" MAX.
PNEUMATICALLY SOLID STOWED GOAF

FIG. 3.—METHOD OF SUPPORTING THE MECHANIZED SOLID STOWED FACE.

TABLE 2.—*Daily Personnel and Cost of Dirt Handling.*

Operation.	Man-shifts.	Rate.	Cost/ton.
		s. d.	d.
Conveyor attd. (two shifts)	4	30 7	1.47
Maintenance of conveyors	1	30 7	0.37
Placing and transporting wagons ..	1	30 7	0.37
Wagons dirt disposal	3	29 7	1.03
Hire of bulldozer	—	40 0	0.48
Power cost	—	—	0.20
Total	9	—	3.92

FIG. 4.—BALANCE HOPPER AND CONVEYOR SYSTEM ON SURFACE DIRT TIP.

feed on to a 30-in. belt conveyor. A constant and even flow of dirt from the stack was delivered on to an extension of the 30-in. conveyor, by a scraper chain pulling through a small hopper arrangement. Dirt was lifted into the hopper by means of a Drott skid shovel. Fig. 5 shows surface arrangements.

The mixed dirt travelled down the stack underneath a strong magnet and over a Niagara screen. The oversize passed through a Kue Ken crusher with serrated jaws which reduced the dirt to below 3 in.

Without bunkerage the dirt entered the mine through the medium of an 18-in. steel pipe range, the pipes having inspection covers spaced at 9-ft. intervals, designed such that the pipes could be turned to allow for wear. The gradient of the pipe range was 1 in 1 and the length 120 yd. The daily surface stowing personnel and cost/ton of coal, based on a saleable output of 1,000 ton/day, is shown in Table 3.

The surface labour cost per ton of dirt handled was 6.8d. per ton.

The average amount of dirt handled in two shifts over a 12-month period was 648 tons, consisting of 204 tons of washery dirt (approximately 140 tons $-\frac{1}{4}$ in. and 64 tons $\frac{1}{4}$ in. to $2\frac{1}{2}$ in.), 20 tons of screen dirt, and 424 tons of dirt from the pit-heap.

It will be observed that there was a reduction of 11 tons of screen dirt compared with first assessment of dirt coming out of the pit. This was due to stopping a conventional face. A further reduction of 52 tons of repair dirt was brought about by the likelihood of closure of the Flockton Seam.

Underground Transport of Dirt

At the bottom of the drift the pipe range was introduced tangentially at the top of a 4-ft. dia. steel cylinder (Fig. 6). This arrangement gave every satisfaction in reducing the momentum of the dirt, preventing spillage,and centralizing the dirt on to the receiving conveyor. A small surge bunker was inserted at the delivery of the first

TABLE 3.—*Daily Surface Personnel and Cost During Stowing Operations.*

Operation.	Man-shifts.	Rate.	Cost/ton.
		s. d.	d.
Conveyor attd. (two shifts)	8	29 7	2.84
Maintenance of conveyors	1	30 7	0.37
Drott driver (two shifts)	2	31 7	0.75
Depreciation of Drott	—	—	0.48
Power cost	—	—	0.80
Total	11	—	5.24

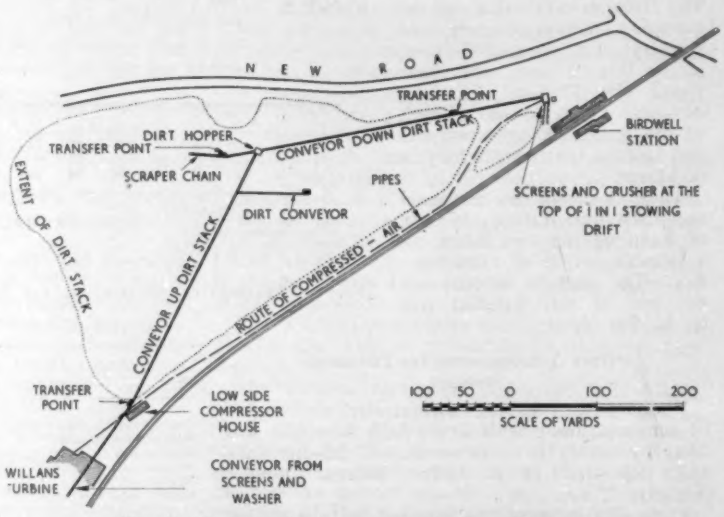

FIG. 5.—SURFACE ARRANGEMENTS FOR DIRT STOWING.

FIG. 6.—BOTTOM OF PIPELINE FROM SURFACE.

conveyor to absorb the dirt already in transit in the pipes should there be any stoppage of the conveyor system.

Fig. 7 shows the general arrangement of stowing belts, stowing machines and telephone communication betwen machine operators. From the small surge bunker the dirt was then transported on 30-in. conveyors, down the return roadway to within 30 yd. of the face on roadways 2 and 4 (Fig. 7). Underground transport personnel and cost/ton for dirt handling based on the average saleable tonnage from the unit under review over a 12-month period are given in Table 4.

Existing surface compressors were used making available approx. 3,500 cu. ft./min. of compressed air at a working pressure of 90 lb./sq. in.

TABLE 4.—*Underground Personnel and Costs of Handling Stowing Dirt.*

Operation	Manshifts.	Rate.	Cost/ton.
		s. d.	d.
Conveyor attd. (two shifts) ..	8	33 11	7.5
Cleaning and maintenance ..	2	32 11	1.7
		56 5	
Stower drivers (two shifts) ..	4	33 11	3.7
Power costs	—	—	1.4
Total	14	—	1s. 2.3d.

The cost/ton of compressed air, based on the tonnage from the unit under review, is given in Table 5.

TABLE 5.—*Cost/ton of Compressed Air.*

Operation.	Manshifts.	Rate.	Cost/ton.
		s. d.	d.
Compressor attd. (two shifts) ..	2	30 7	1.7
Power costs	—	264 2	7.3
Total	2	—	9.0

The pipe range from the surface to within a few hundred yards of the face was 12-in. dia. (2,100 yd.) and the pipe range inbye to the face was 6-in. dia. Working pressure at the inbye end was 60-70 lb./sq. in. To obtain the most economical use of the compressed air, the air flow was regulated by an automatic stowing valve, functioning on back pressure, which controlled the flow of air to suit the load in the pipeline.

Coal-face Stowing Arrangements

The dirt on the stowing conveyors was discharged into electrically driven standard Markham stowing machines (Fig. 8). Although the dirt entering the machine contained varying amounts of

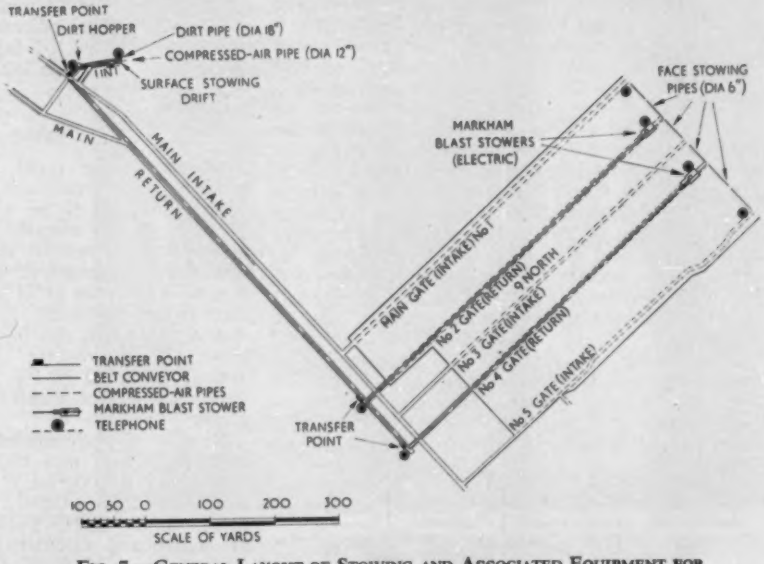

FIG. 7.—GENERAL LAYOUT OF STOWING AND ASSOCIATED EQUIPMENT FOR 9's NORTH PANEL.

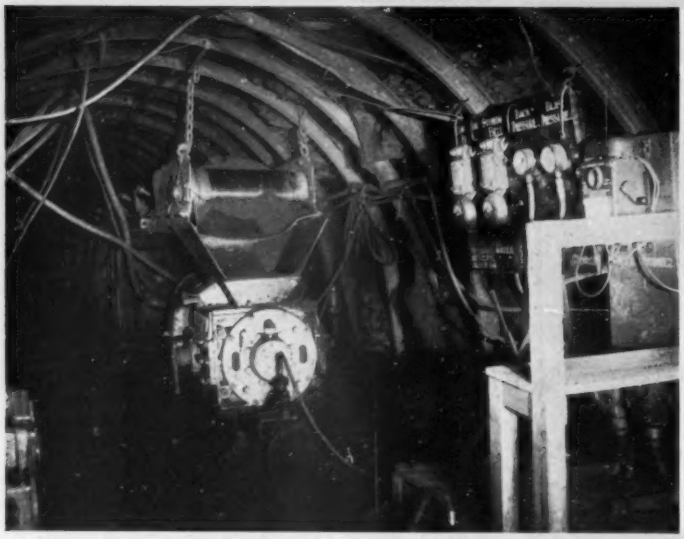

FIG. 8.—CONVEYOR DELIVERY INTO STOWING MACHINE.

moisture, depending on its source of origin, it was found advantageous to direct a continuous flow of water on to the back of the paddles. This served to prevent clogging of the paddles, minimized blockages at the face bend, assisted in consolidating the pack, and minimized the dust on the face. The stowing pipes used were of high-carbon steel 6 in. dia., ½ in. thick, and 6 ft. long, and were coupled by quick-release wedge-type couplings. Flanged pipes were used in the gates.

The stowing machine and conveyor gearhead were built up on wheels and advanced on pre-laid track every 60 to 80 yd. of face advance. Corrugated sheets, 6 ft. by 2 ft. 6 in., bent over at the top, and having a strip of belting fastened at the base were erected on the goaf side of the line of props to support the pack and to prevent material flying into the face. Progress made was in steps of 18 ft. of face or three pipe lengths. Stowing was carried out on day and afternoon shifts, while two strips of coal were taken on the day shift.

For safety reasons instructions were given that in no circumstances must the shearer be allowed to pass the stowing area when stowing was in progress.

The stowing teams consisted of three men, two men being employed moving pipes over, withdrawing, and erecting supports. They also took down and erected the corrugated sheets. The third operated the deflector at the discharge end and controlled the signals. The teams on each shift consisted of:—Day shift, two teams of three men; afternoon shift, two teams of three men, comprising a total manpower of 12/24 hr. The average daily volume stowed over a period of 12 months was 9,720 cu. ft., equivalent to 648 tons of dirt. The performance on each shift is given in Table 6.

TABLE 6.—*Stowing Results on Each Shift.*

Cu. ft. stowed/ machine shift.	Tons of dirt/ machine shift.	Cu. ft. stowed/ manshift.	Tons of dirt/ manshift.
2,430	162	810	54

The maximum tonnage of dirt sent underground in 24 hr. was 1,008. This was during a short period when three strips were taken off the face. The total amount of dirt sent underground from July 1, 1958, to the end of December, 1959, was 245,800 tons.

Taking into consideration that the stowing machines were alternating with each other and that 60 min. were lost when changing sides, *i.e.*, turning bend and preparing 18 ft. of face, it was essential that the maximum stowing performance of one machine was obtained.

The time available for machine operation each shift was 390 min. and the time taken to prepare 18 ft. of face for stowing was 18 min. The time taken to stow 18 ft. of face 3 ft. 3 in. high and 4 ft. 6 in. wide was 12.6 min., giving a stowing rate of 47.6 cu. yd./hr. Signalling delays amounted to 1.4 min., giving a total time required to stow 18 ft. of face of 32 min.

The above data indicated that it was possible to stow 70 to 75 yd. of face with one machine per shift, equivalent to 3,262 cu. ft., or 216 tons, of dirt per shift.

Future Trends

Owing to the rapid advance which can be attained from mechanized units and the vast reserves of coal to be worked underlying surface property, it was essential that a method be found to increase the rate of stowing per machine shift, Therefore, the length of waste between Nos. 2 and 3 gates, a distance of 38 yd., was fitted with a fully mechanized hydraulic support system, shown in Fig. 9, in which the backing sheets and stowing pipes did not require handling. With the new system, indicated in Fig. 10, the time to prepare 18 ft. of face for stowing was reduced to 3 min., giving a total time of 17 min. to stow 18 ft. of face.

Results of study proved that it was possible to stow 120 yd. of face with one machine per shift, equivalent to 5,000 cu. ft. or 330 tons of dirt per shift. The figures quoted allowed 50 min. for any delays in the shift. Table 7 gives a comparison of actual and calculated face costs during the six-month period from April 1 to September 30,

TABLE 7.—*Coal-face Personnel, Cost/Ton Saleable, and Manshifts/Thousand Tons.*

Occupation.	Pneumatic stowing five gates (actual).		Strip packing five gates (calculated).		Pneumatic stowing three gates (calculated).	
	Manshifts/ 24 hr.	Cost/ton saleable.	Manshifts/ 24 hr.	Cost/ton saleable.	Manshifts/ 24 hr.	Cost/ton saleable.
		s. d.		s. d.		s. d.
Stable holes	6	—	6	—	6	—
Moving supports over	7 days 2 noons	4 2.9	15	5 8.2	7 days 2 noons	4 2.9
Machine operators	2	—	2	—	2	—
Stowing (two shifts)	6 days 6 noons	2 3.6	—	—	6 days 3 noons	1 8.7
Ripping	13	2 7.3	14	2 9.7	9	1 9.6
Rib side dint, etc.	2	0 3.2	2	0 3.2	2	0 3.2
Prop maintenance	1	0 1.1	1	0 1.1	1	0 1.1
Panzer operator	1	0 1.1	1	0 1.1	1	0 1.1
Shotfirer	1	0 1.9	1	0 1.9	1	0 1.9
Total	47	9 9.1	42	9 1.2	40	8 4.5
Manshifts/1,000 tons	108.57		96.6		92.4	

1959. In making comparisons all known factors must be taken into consideration.

When initial planning took place, as this was the first attempt to pneumatically stow a mechanized face 310 yd. in length, it was decided to keep well within the optimum performance so as to give the scheme every chance of success.

In the light of experience, the panel of coal could have been worked with three roads, the centre road being the return and stowing road. There would then have been a saving of four ripping shifts per 24 hr. By providing sufficient quantity of compressed air to enable two stowing machines to operate simultaneously in the centre road, there is no doubt a reduction of at least three stowing manshifts per 24 hr. could have been obtained. From this assumption, the face manshifts/24 hr. for pneumatic stowing could be reduced from 47 to 40 and the face costs from 9s. 9.1d. to 8s. 4.5d., a reduction of 1s. 5.6d. per ton.

With three roads to the panel and the elimination of a roadway conveyor there would be saving of four manshifts/24 hr. on underground dirt transport reducing transport costs from 1s. 2.3d. to 10.5d.

Face Support Costs

A tremendous reduction in the face support costs per ton can be effected by pneumatic stowing incorporating hydraulic props. Over a 12-month period, the average daily face consumption of timber was five props at 1s. 3.25d. each, 10 props at 1s. 9.5d. each, and 12 tapered wedges at 5.5d. each, amounting to a total face timber support cost of 0.83d./ton.

For the same period from a total of 1,220 props the losses were nil. Only two corrugated bars were lost in this period. The average number of props sent out to the surface for repairs each month over a period, from June 1 to November 30, 1959, was 14 props at a cost of 1.2d./ton. These figures show a vast saving in materials and transport costs which can be offset against the cost of transporting dirt to the face.

Repair and renewal charges to the underground and surface stowing system during the first six months of 1959 was £721, a cost of 3.1d. per ton of coal, based on tonnage of coal from the stowed unit.

All conveyor structure and belting, both surface and underground, was salvaged from old districts. The compressed-air pipes were also salvaged from a previous project.

Table 8 shows cost per ton variances which appear when comparing pneumatic stowing with strip packing. Comparing pneumatic stowing with

FIG. 9.—DOBSON "DOUBLE TWO" MECHANIZED SUPPORTS FOR SOLID STOWING.

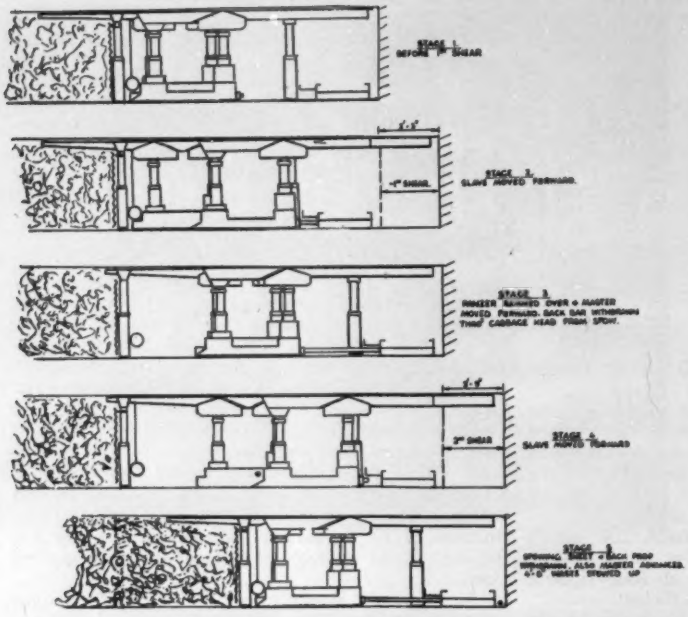

FIG. 10.—SYSTEM OF SOLID PNEUMATIC STOWING WITH DOBSON "DOUBLE TWO" SELF-ADVANCING SUPPORTS.

strip packing with a five-gate face pneumatic stowing is cheaper by 0.95d.

Effect of Pneumatic Stowing on Gate Roadways

All five gates stood exceptionally well. Back ripping and dinting on all gates were eliminated and only slight distortion of the occasional arch took place over pillar edges. Fig. 11 illustrates the effectiveness of pneumatic stowing and shows the gradual convergence taking place. It is interesting to note that 4 in. less convergence took place in the centre gate compared with that of the two outer gates.

A similar mechanized strip-packed panel had been previously worked in the same seam and necessitated eight to 12 shifts per 24 hr. to keep the gates open. Floor lift was excessive and the arches were very badly distorted. The pressure on the gate packs was so severe that the 18 in. of fireclay floor was squeezed out from under the packs into the roads.

Fig. 12 indicates a comparison of face convergence between the pneumatic stowed face and the strip packed mechanized face previously referred to, on which the support system was friction props and corrugated bars.

Further to reduce convergence between the coal face and the edge of the stowed waste a more resistant face support could be utilized provided that the immediate floor and roof were strong enough to prevent penetration.

Many other advantages have been observed from pneumatic stowing, the value of which cannot be readily estimated, *e.g.*, in terms of cost per ton. They are:—

(1) Working conditions on the face were excellent throughout the whole life of the face and no tonnage was lost.

(2) Greater safety to the workmen employed on the face; throughout the 18-month period, the accident rate per 1,000 tons of saleable coal was 0.12.

(3) Reduction of gas emission, gas emission records show the average gas content in No. 2

TABLE 8.—*Comparison of Cost/Ton of Pneumatic Stowing in Flockton 7's South with Hand Packing and with a Pneumatically Stowed Face with Three Gates.*

Items showing variance.	Cost/ton strip packing five gates (calculated).	Cost/ton pneumatic stowing five gates (actual).	Cost/ton pneumatic stowing three gates (calculated).	Remarks.
	s. d.	s. d.	s. d.	
Compressed air	—	0 9.0	1 0.0	Extra compressed air required with three gates.
Surface dirt disposal	0 3.92	0 5.24	0 5.24	
Underground dirt transport	—	1 2.3	0 10.5	
Repair and renewal cost (stowing)	—	0 3.1	0 3.1	
Face costs (labour)	9 1.2	9 9.1	8 4.5	
Face support costs	1 5.0	0 0.83	0 0.83	Additional chock wood for Gofar chocks and chocks set on breaking off lines of gates.
Prop losses and repairs	0 4.0	0 1.20	0 1.20	Greater losses and repairs.
Bar losses	0 0.4	—	—	Greater losses.
Repair roadways (eight men)	1 1.0	—	—	Minimum repair shifts taken.
Material cost for repairs	0 5.5	—	—	Replacement arches covering material and transport.
Depreciation of stowing equipment	—	0 1.3	0 1.3	
Total	12 9.02	12 8.07	11 2.67	

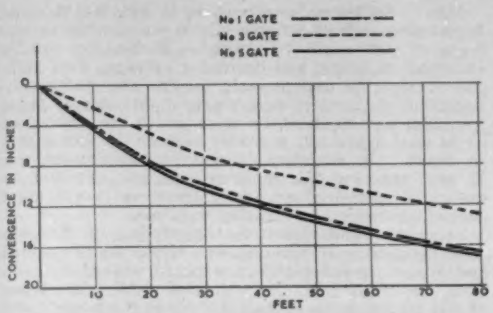

FIG. 11.—RECORDED RATE OF CONVERGENCE IN NOS. 1, 3, AND 5 GATES.

return gate to be 0.08 per cent. with a quantity of air, 8,000 cu. ft. of air/min., while on No. 4 return gate the methane content was 0.9 per cent. with a quantity of 7,300 cu. ft. of air/min. The average methane content on the previously worked strip packed face was 0.36 per cent. with a similar quantity of air passing.

(4) The apparent ease of withdrawing the roadway supports and the vast saving in labour due to the withdrawn arches not being distorted.

(5) The effect of pneumatic stowing on the surface justified the chosen method of working and effectiveness of pneumatic stowing, the following figures being obtained from a 40-in. extraction:—(*a*) 100-yd. face, 125 yd. deep, strip packed, subsidence 32.3 in.; (*b*) 100-yd. face, 110 yd. deep, slusher packed, subsidence 26.3 in.; (*c*) 300-yd. face, 120 yd. deep, pneumatic stowed, subsidence 21.3 in.

In the cases (*a*) and (*b*) subsidence had developed during the critical period at the rate of 1 in./day. In the case of pneumatic stowing the rate was 1 in. in three days. Damage to the property was much lighter than anticipated. Very few new breaks were caused and the more serious damage was caused where ribs had been left by the deeper workings as expected.

(6) No dirt deposited on the spoilheap and a substantial volume of the existing heap having been transferred underground.

Conclusions and General Remarks

With proper planning it is possible to solid stow pneumatically at a cost commensurate with that of conventional systems of waste packing. Further economies would result if the loading and transport systems could be utilized to full capacity, *i.e.*, if all the faces in a particular section were stowed. This is not uncommon in many continental mines.

Because of the greater relative tonnage to be handled, successful solid stowing demands a transport system equal if not greater in capacity to that provided for transporting the coal outbye. Pneumatic stowing has many advantages over conventional methods which cannot readily be assessed in terms of cost per ton, but which considerably increase the safety and reliability of production.

A more universal application of the system would undoubtedly result in a reduction in the ever-growing volume of spoilheaps. The trials carried out with the fully mechanized face support system proved that high tonnages of dirt can be pneumatically stowed per machine shift on mechanized faces.

The author wishes to thank Mr. J. E. Longden, Area general manager, No. 5 (South Barnsley) Area, North-Eastern Divisional Coal Board, for permission to give this paper and to all who have assisted in its preparation. Where opinions are expressed, they are the author's and are not necessarily those of the board.

DISCUSSION

Replying to MR. J. OATES and MR. C. F. PALMER, who proposed and seconded a vote of thanks, the AUTHOR said it was most essential on any large stowing project to incorporate storage bunkers. Consideration should be given to store dry and washery dirt separately as excessive bunkering of mixed dirt gave rise to blocking in the bunkers with considerable inconvenience. Many advantages could be obtained in siting the stowing machine in line with the stowing track. They had two standard Markham stowing machines in line with the coal face, compressed air being made available by low-pressure blower units. District dirt, along with dirt from drifts was crushed at a convenient point and the minus 3-in. product con-

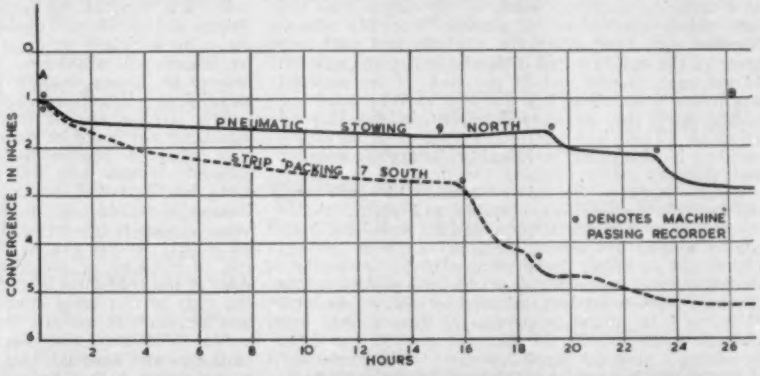

FIG. 12.—COMPARISON OF FACE CONVERGENCE BETWEEN THE PNEUMATIC STOWED FACE AND A STRIPPED PACKED MECHANIZED FACE. THE DISTANCE TO THE FACE AT "A" WAS 3 FT. 4 IN. AND AT "B" 10 FT. 1 IN. THE TOTAL CONVERGENCE WAS 0.28 IN./FT. OF ADVANCE, OR 0.11 IN./HR., WITH PNEUMATIC STOWING AND 0.53 IN./FT. OF ADVANCE, OR 0.2 IN./HR., WITH STRIP PACKING.

veyed to the stowing machine. In the very near future a direct-on-face machine would be sited in the centre gate of a 250-yd. face with the intention of solid stowing the complete waste and the centre gate road side packs. The face pipe bend would be eliminated and a saving of approximately 60 per cent. in power consumption was expected.

MR. J. E. LONGDEN asked Mr. Crankshaw how much coal was lost in the goaf. In his experience between 5 and 10 per cent. of the coal mined by conventional methods in this country had been lost in the goaf. It was not difficult to work out the reduction in cost which would be obtained if this loss were eliminated.

The AUTHOR agreed that too much coal was lost in the goaf. With mechanization there was a good opportunity to eliminate this bad practice. Throughout the working life of the solid-stowed face, no evidence of coal being lost in the goaf was observed.

MR. J. T. E. JONES asked whether similar results could be anticipated if stowing was being undertaken in a seam 600 to 700 yd. deep. The gas emission would be increased and a larger quantity of ventilation would be required to ventilate the unit.

In the AUTHOR'S opinion similar results could be obtained in seams 600 to 700 yd. deep providing sufficient care was taken with the initial planning. Assuming that it was considered uneconomic to feed dirt from the surface inbye, dirt could be prevented from coming out of the pit by installing a crusher, inbye blower, and stowing unit. One must agree that the longer the face the greater would be the rate of gas emission, but assuming the waste was solid stowed, the gas emission would be greatly reduced. To stow pneumatically a face 200 to 300 yd. in length would necessitate at least three gates, the two outer gates would be intakes and centre gate the return, thereby reducing the velocity of the air current. It was not uncommon in shallow mines to work faces having 25,000 cu. ft. of air/min. circulating.

MR. J. H. WEAVER said they had some 14 pneumatic stowing installations in the West Midlands Division and asked the author's view on a problem of stowing 600 to 800 ton/day of washery discard having a moisture content of 14 per cent. and comprising unstable and plastic shales of below 1 in. Mr. Weaver also asked if the author would consider it necessary to add dry dirt as a scouring medium. Some of the debris they had seen being stowed at Wharncliffe was like slurry. Samples had been taken for analysis and, although some of the moisture had drained away, there was still 14 per cent. present and 51 per cent. of the material was minus ¼ in. Was it a question at Wharncliffe of adding water to act as a lubricant in the stowing column? They had considered this as a means of avoiding blockage, but had doubts about pack stability and drainage water affecting the floor.

When washery discard contained 14 per cent. moisture and comprising unstable and plastic shales minus 1 in. in size, the AUTHOR said he would not hesitate in adding a scouring medium of 2½-in. to 1-in. This could be either dry or discard from the washer. Very good stowing results were obtained at Wharncliffe Silkstone from a washery mixture of minus ¼ in. and 2½ in. to ¼ in. in the proportion of three to one, the moisture content being in the region of 12 per cent. By adding a plentiful supply of water to the feedwheel of the stower it acted as a lubricant to the feedwheel, face pipe bend, pipes and deflector, reduced the number of blockages, reduced wear, thus increasing the life of the stowing equipment. The water consolidated the stowing material, reduced sparking at the deflector end, minimized dust, and had no adverse effect on the floor.

MR. C. SHEPHERD, also replying to Mr. Weaver, said it was very difficult to give advice on whether various types of dirt could be stowed. If the dirt rapidly absorbed moisture and formed a sludge, then difficulties might be experienced. In the case under consideration the greater percentage of dirt stowed came from the dirt band in the seam which was recovered in the washer and was probably back on the face within an hour. The moisture content on the average was 12 per cent., but this moisture was only retained by surface tension and apparently there was not a great deal of absorption by the clay minerals.

Experience had shown that bunkering of dirt was only practicable if the dirt was either freshly mined and dry, burnt red shale, or screened washed dirt, *i.e.*, with the minus ¼-in. size extracted. All other types of dirt tended to form a solid mass in the hopper and would not flow. Adding a percentage of large dirt would enable washery fines to be stowed. If this was added dry, then it was absolutely essential to remove the dry fines. They could not stow unmixed minus ¼-in. dirt for long periods without face pipe blockages. Recovered burnt spoil heap dirt was also stowed successfully, but care was taken not to mix this with the washery dirt. A standard stowability test could probably be evolved and there was scope for research along these lines.

MR. J. E. LONGDEN commented that experiments with the damping of burnt red shale for solid stowing had been carried out and it was found that 8 per cent. moisture was the correct amount to apply. This amount eliminated sparking at the delivery end of the pipe in the goaf.

Replying to MR. D. W. ALEXANDER, who had experienced difficulties in keeping a direct-on-face stowing machine up to the required position at the face, the AUTHOR said the stower would be put to work on a face supported by Dobson Double Two's. This system of support would enable the stowing machine to be sited 4 ft. from the centre gate ripping canch and moved forward every 4 ft. 6 in. of face advance. The ripping for this application would give good fragmentation and would be passed through the stower. Gate side packs would be pneumatically stowed.

MR. J. S. SWIFT asked for further information about the dirt on the surface and how much water, in gal./min., was used at the feedwheel of the blast stower. Sticky dirt could be "flushed" through the feedwheel by using sufficient water as was done in this instance at Wharncliffe Silkstone. Sticky material was being stowed in certain cases in North Staffs and there was no difficulty if sufficient water was used.

The AUTHOR was of the opinion that any kind of spoilheap dirt could be stowed providing sufficient care was taken in placing the dirt on to the conveyor system. It had been found essential to form a dirt face, the Drott skid shovel lifting and carrying the dirt instead of bulldozing. Bulldozing dirt on to the conveyor especially in wet weather produced large amounts of sludge; this, if placed in the stowing system, gave rise to blocking of the pipes. The amount of water used at the feedwheel of the stower varied according to the type of dirt being stowed. With sticky material it was necessary to increase the water supply.

MR. F. DARLEY, who was concerned with the density of the stowed material, said that 15 cu. ft./ton seemed to be rather high. Referring to the fully automatic system in Fig. 10, Mr. Darley said there were girders apparently about 5 or 6 in. deep sticking back into the stowing track and asked if these were moved forward before stowing or after?

Replying, the AUTHOR agreed that the density of the stowed material appeared to be a little high, but was

due to 45 per cent. of the stowing material being minus ¼ in., additional water being added at the stower and the high standard of stowing being done. The average weight of 1 cu. ft. of loose material leaving the deflector was 89.25 lb. The average weight of 1 cu. ft. of packed material had been assessed at 142.5 lb. The girders referred to were moved forward after stowing.

When MR. F. DARLEY said that these bars were still in position when stowing was done and that there would be a void behind each bar which would reduce the density of the stowing, the AUTHOR replied that the back bar and prop had been incorporated into the support system to provide roof support for the stower operator when working the deflector and also to provide a means for attachment of the stowing sheet and the suspension of stowing pipes. The back bar protruded into the stowed area, and there was bound to be a certain amount of void. If the roof in the stowing area was unsupported, then the void would be greater, due to immediate roof separation and possibility of pieces of dirt falling from the roof.

MR. P. GRANT, who was interested in the subsidence of the surface, asked if a large area of partial extraction work would be made available for full extraction if this method was used.

Replying for the author, MR. J. E. LONGDEN said they were at present working out a seam 3 ft. 6 in. thick under the town of Barnsley, the goaf being solid stowed, and no complaint of subsidence had yet been made. They were fully satisfied that various seams under towns could be extracted by this method.

MR. J. L. DAVISON was interested in the statement that it took only 3 min. to prepare 18 ft. of face for stowing and that the stowing team consists of only two men. He could not see how this could be done if catch props had to be sawn and set as well in that short time.

In reply, the AUTHOR said that with the mechanized support system, to prepare 18 ft. of face for stowing necessitated releasing, advancing, and resetting four back props. These operations were carried out from control levers on the hydraulic system. Each back prop carried one stowing sheet 6 ft. 6 in. in length. With back props spaced at 4 ft. 6 in. centres this gave a 1-ft. overlap at each end. Stowing pipes 9 ft. in length were suspended from two back bars each and came across automatically when the corresponding two back props were brought forward. The only manual operation was the breaking and reassembling of each quick-release type pipe joint.

1860 — 1960

Qualter, Hall's Centenary

TWO anniversaries were celebrated by Qualter, Hall & Company, Limited, Railway Foundry, Barnsley (Yorks), on Tuesday. November 1 marked the completion of the 50th year as a limited company, and it was also on that date 100 years ago that George Bower, one of the founders of the company, was granted a patent covering a unique type of piston which provided the base, and the reason, for the early trading activities of the company. Another of the founders was Edward Hall, and for the past 60 years his descendants have controlled and directed the company as a family concern.

Having managed to persuade some engineers to use the patent piston in steam engines driving mill machinery, George Bower, who was a moulder, needing practical help, enlisted the assistance of his blacksmith friend, John Qualter, and of Edward Hall, who was nearing the completion of his apprenticeship as an engine fitter. The team was thus formed, and it was this early co-operation in the Manchester district for the development of Bower's piston which provided the foundation on which the fortunes of the Barnsley company were later to be built.

The move to Barnsley actually came in 1867, and it also resulted in another partner, John Needham, joining the original triumvirate on an equal footing. Bower was unwilling to leave Lancashire, although he wished to take a full financial share in the firm; it was therefore felt necessary to bring in another moulder to ensure a balanced partnership. Each contributed £100 to form the company, known first as the Railway Foundry Company and later styled as Needham, Qualter, Hall & Company. Incidentally, there appears to have been a fifth partner, Thomas Dunston, for a short period around 1870. It was in 1875 that the title Qualter, Hall & Company was adopted.

Although the foundry work slackened during 1878 and 1879, the company was beginning to develop its colliery engineering products and 1880 was a year of great physical expansion. The story of the company's expansion in the mining field—and, indeed, in other directions, too—is a fascinating one. It is related in a handsome publication which the author, Mr. Philip J. Hall, has called "A Handful of History."

Application for Patents on Liquid Purification Process

WORLD-WIDE patents have been applied for in the joint names of the North Western Gas Board and the Clayton Aniline Company, Limited, in respect of a process for extracting hydrogen sulphide and recovering pure sulphur from coal gas, petroleum gases, and other gases, by the use of certain reagents produced in the manufacture of anthraquinone dyes from coal tar.

The new process has been on test on a commercial scale for the past 12 months.

Agreements have been entered into to grant licences —if patents are granted—to exploit the process to six chemical engineering firms—W. C. Holmes & Company, Limited, Newton, Chambers & Company, Limited, R. & J. Dempster, Limited, Simon-Carves, Limited, Humphreys & Glasgow, Limited, and Woodall-Duckham Construction Company, Limited.

Forthcoming Events

NOVEMBER 7

Institute of British Foundrymen (Sheffield Branch):—Meeting at the Technical College, Pond Street, Sheffield, at 7 p.m. "Precision in Casting," by A. Short.

Society of Engineers:—Meeting at the Geological Society, Burlington House, London, W.1, at 5.30 p.m. "The Heat Pump in Great Britain," by Miss M. V. Griffith.

NOVEMBER 8

Institution of Civil Engineers:—Meeting at 1-7, Great George Street, London, S.W.1, at 5.30 p.m. "Some Contributions from Nuclear Power to Engineering," by I. Davidson.

Institute of Marine Engineers:—Meeting at the Memorial Building, 76, Mark Lane, London, E.C.3, at 5.30 p.m. "General Developments in Ceramics for Marine Engineering," by F. J. Aldred and N. W. Hinchliffe.

Sheffield University Mining Society:—Meeting in the Mining Lecture Theatre, St. George's Square, Sheffield 1, at 5 p.m. "Some Impressions of the United States of America," by Dr. A. Roberts, research director, Sheffield University Mining Department.

Institute of Engineers and Shipbuilders in Scotland:—Meeting at 39, Elmbank Crescent, Glasgow, C.2, at 6.30 p.m. "Axial Vibration in a Single-screw Cargo Ship," by Dr. A. J. Johnson and W. McClimont.

Institution of Chemical Engineers:—Meeting at the Geological Society, Burlington House, London, W.1, at 5.30 p.m. "The Dynamic Response of a Distillation Column to Changes in the Reflux and Vapour Flow Rates" and "An Introduction to the Theoretical Evaluation of the Frequency Response of a Distillation Column to a Change of Reflux Flow Rate," both by R. M. Wood and W. D. Armstrong.

Institution of Plant Engineers (Manchester Branch):—Meeting at the Engineers' Club, Albert Square, Manchester, at 7.15 p.m. "Pressure Vessels," by C. W. Scarisbrook.

Institution of Electrical Engineers (North-Western Centre):—Joint meeting with the Mersey and North Wales Centre at the Engineers' Club, Albert Square, Manchester, at 6.15 p.m. "Submersible Pumping Plant," by W. H. Anderson and W. G. Crawford.

Institution of Electrical Engineers (Northern Ireland Centre):—Meeting at the Civil Engineering Department, David Keir Building, Queen's University, Stranmillis Road, Belfast, at 6.30 p.m. "The Application of Irradiation in Industry," by M. C. Crowley-Milling.

Institution of Production Engineers (Doncaster Section):—Meeting at the New Technical College, Doncaster, at 7 p.m. "Current Management Thinking of Personnel Problems," by R. J. Stevenson.

Institution of Production Engineers (Birmingham Graduate Section):—Meeting at the James Watt Memorial Institute, Great Charles Street, Birmingham, at 7 p.m. "Automatic Linking Device," by J. B. Jay.

Institution of Production Engineers (Oxford Section):—Meeting at the Town Hall, Oxford, at 7.30 p.m. "Materials Handling."

NOVEMBER 8-9

Combustion Engineering Association:—Conference on "Getting the Best Out of Coal," at Harrogate.

NOVEMBER 9

Institution of Production Engineers (Preston Section):—Meeting at the Harris College, Corporation Street, Preston, at 7.30 p.m. "Economics of Machine-tool Purchase," by J. Borsay.

Institution of Production Engineers (Edinburgh Section):—Meeting at the North British Hotel, Princes Street, Edinburgh, at 7.30 p.m. Film night.

Institution of Production Engineers (London Graduate Section):—Meeting at 10, Chesterfield Street, London, W.1, at 7.15 p.m.

Institution of Production Engineers (Western Section):—Meeting at Bristol University. "Some Principles of Production Management," by R. H. Dyson.

Institution of Plant Engineers (East Midlands Branch):—Meeting at the County Hotel, Theatre Square, Nottingham, at 7 p.m. "Communicating with Others," by R. Gregory.

Institution of Plant Engineers (Leicester Branch):—Meeting at the Midland Hotel, Leicester, at 7.30 p.m. "Industrial Power Generation."

Institution of Plant Engineers (Western Branch):—Meeting at the Grand Hotel, Broad Street, Bristol, at 7.15 p.m. "Modern Engineering Insurance," by K. J. Roberts.

NOVEMBER 9-10

Institution of Mechanical Engineers:—Symposium on "The Use of Secondary Surfaces for Heat Transfer with Clean Gases" at 1, Birdcage Walk, Westminster, London, S.W.1.

NOVEMBER 10

Institution of Production Engineers (Leicester Section):—Meeting at the Queens Hotel, Leicester, at 7.15 p.m. "Machine-tool Control," by C. J. Charnley.

Institution of Plant Engineers (Glasgow Branch):—Meeting at the Scottish Building Centre, 425, Sauchiehall Street, Glasgow, C.2, at 7.15 p.m. "Planned Lubrication in a Modern Steelworks," by J. Stewart.

Institution of Plant Engineers (North East Branch):—Meeting at Roadway House, Oxford Street, Newcastle-upon-Tyne 1, at 7 p.m. "The Planning and Operation of Industrial Estates," by G. Perry.

Institution of Mechanical Engineers (Eastern Branch):—Meeting at the Royal Hotel, Luton, at 7.30 p.m. "The Inspection of the Primary Circuits and Reactor Pressure Vessels of Nuclear Power Plants," by H. N. Pemberton and E. Crossley.

NOVEMBER 11

Society of Instrument Technology (Midland Section):—Meeting in the Lecture Theatre of the Byng Kendrick Suite of the Gosta Green College of Technology, Aston Street, Birmingham, at 7 p.m. "The Commonsense Approach to Instrument Manufacture," by C. E. T. Cridland.

Institution of Production Engineers (Ipswich and Colchester Section):—Meeting at the Golden Lion Hotel, Ipswich, at 7.30 p.m. "The Practical Application of Production Engineering Research," by Dr. D. F. Galloway.

NOVEMBER 12

Institute of British Foundrymen (Scottish Branch):—Meeting at the Royal College of Science and Technology, Glasgow, C.1, at 3 p.m. "Technical Education of Foundry Apprentices, Present and Future," by M. Gallaghan.

NOVEMBER 14

Lincolnshire Iron and Steel Institute:—Meeting at North Lindsey Technical College, Kingsway, Scunthorpe, at 7.30 p.m. "The Application of Research to Steelworks' Refractory Problems," by Dr. P. W. Clark.

Institute of Marine Engineers (South Wales Section):—Meeting at the Welsh College of Advanced Technology, Cathays Park, Cardiff, at 7 p.m. "Modern Marine Steam Turbines," by J. H. Gooch.

Institution of Production Engineers (Sheffield Section):—Meeting at the Grand Hotel, Sheffield, at 6.30 p.m. "Types of Rolls for Modern Rolling Mills," by E. Hallas and R. Lee.

Institution of Production Engineers (Halifax and Huddersfield Section):—Meeting at the Percival Whitley College for Further Education, Francis Street, Halifax, at 7.30 p.m. "Tool Wear and Machinability," by Dr. E. M. Trent.

NOVEMBER 29-30

Iron and Steel Institute:—Autumn general meeting at Church House, Great Smith Street, London, S.W.1.

NOVEMBER 29-DECEMBER 2

Corrosion and Metal Finishing Exhibition:—At the Empire Hall, Olympia, London.

National Association of Colliery Managers

NOVEMBER 7

South Midland Branch:—Meeting at Ashby Rescue Station at 4 p.m. "The Workable Reserves of South Derbyshire and Leicestershire Coalfields," by M. Hall and W. J. Hutchinson.

NOVEMBER 15

Yorkshire Branch:—Meeting at the Miners' Welfare Hall, Brodsworth, at 3 p.m. "Analysis of Accidents During the Last Five Years," by J. Blunt.

NOVEMBER 23

Lancashire Branch:—Meeting in the Lecture Room, Manchester Literary and Philosophical Society, George Street. R. H. Clough, HM Divisional Inspector of Mines, will introduce his report on the North Western Division for 1959.

NOVEMBER 25

Kent Branch:—Meeting at the Swan Hotel, Deal, at 7.15 p.m. "The Coal Plough," by J. McFarlane, divisional mechanization engineer, Northern (N & C) Divisional Coal Board.

NOVEMBER 28

Midland Branch:—Meeting at the Denman's Head Hotel, Sutton-in-Ashfield, at 6.30 p.m. Paper by G. A. Percival, ventilation engineer, No. 4 Area, East Midlands Divisional Coal Board.

Introducing his paper, which he presented at the annual meeting of the British Association for the Advancement of Science at Cardiff, August 31-September 7, 1960, the author said that little work on the physical or mathematical side of the subject of creep in steel had so far been done. Such treatments that had been made on metals were confined to single crystals and polycrystalline aggregates of pure metals and simple solid solution alloys. The fact that steel was essentially a two-phase alloy of iron and carbon made such a treatment extremely difficult in the present state of the art. Hence, the paper would be concerned with the technological aspects of the subject.

CREEP in STEEL

TECHNOLOGICAL ASPECTS OF THE SUBJECT

By J. D. MURRAY

(*United Steel Companies, Limited*)

CREEP, which is the deformation that occurs over a period of time under a constant load at and above specific temperatures, was first recognized in and investigated from the early part of this century. With respect to steel the phenomena only becomes of major importance at temperatures above 350 deg. C. and it was not until 1925 that the first creep experiments were carried out on it.

The main interest in the subject arose when power plant design engineers first considered steam temperatures in excess of 350 deg. C. in conventional power stations. From this start there was a steady increase in interest in the subject, and also in the research effort extended on it, up to the outbreak of the second world war. At this stage the development of the gas turbine engine was accelerated and this, in turn, meant that a greater study of creep in steel was required. The post-war years have seen the further development of the gas turbine, renewed interest in conventional power plant and also the development of nuclear power stations.

Fig. 1 gives a good idea of the increase in research effort that has been expended in the past 30 years. It shows the increase in test facilities that has taken place in the laboratory with which the author is connected. The stages that have been mentioned previously are clearly marked. For convenience they have been divided into decades. Possibly the most notable feature is the rapid rate of increase that has taken place in the last two or three years.

It might be inferred from what has been said that this latest increase is due to the development of power plant of more advanced design including those of the nuclear type. There is, however, an additional important factor which has not been mentioned, namely, the change in opinion as to what constitutes realistic information on which to base design. This leads to the consideration of the engineering aspect of the subject.

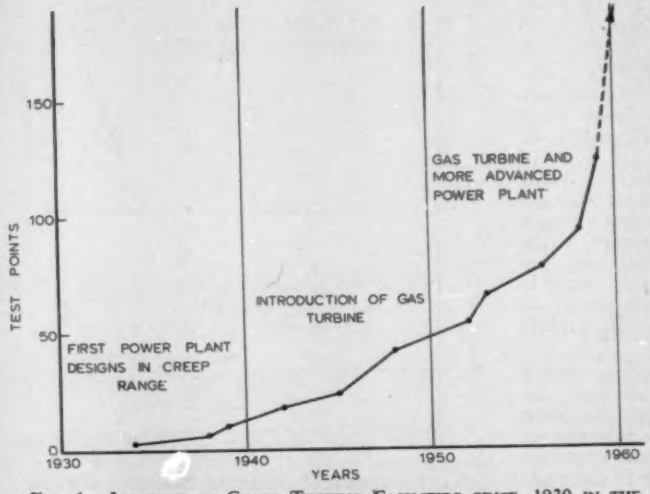

FIG. 1.—INCREASE IN CREEP TESTING FACILITIES SINCE 1930 IN THE LABORATORY OF THE UNITED STEEL COMPANIES.

Engineering Aspect

As in all engineering equipment, a component becomes unserviceable when it loses tolerance or, alternatively, when it finally breaks. In connection with the subject of creep, the design of the revolving parts of the gas turbine and similar parts of the steam turbine are generally based on some close tolerance criterion, *i.e.*, components become redundant once they have extended beyond a certain limit. On the other hand, in non-moving parts of turbines and in carrier tubing and piping,

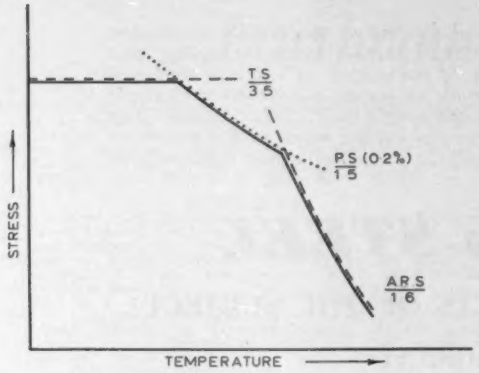

FIG. 2.—STRESS *v.* TEMPERATURE RELATIONSHIP FOR PRESSURE VESSEL DESIGN.

pressure vessels and boilers, the main criterion of unserviceability is the ultimate rupture of the component.

In general, design engineers are a law unto themselves; consequently, some of their methods for arriving at design stresses are not widely known. However, in plant designed in accordance with standard specifications, certain design codes are evident.

Fig. 2 shows the latest ideas that are being adopted in British Standard Specifications for pressure vessel design. It will be noticed in the plot of stress *v.* temperature that there are three distinct sections to the curve. The first relates to a factor of the tensile strength (TS/3.5) the second to a factor of the proof stress (0.2 per cent. proof stress/1.5) and the third to a criterion of creep. In the case shown, 60 per cent. of the average stress for rupture has been used as the creep criterion. The design stress is the lowest stress derived from consideration of each of these three criteria.

The above method is very similar to the procedures laid down by the A.S.M.E. Boiler Code in the USA, the values in which are calculated from the following criteria.—(*a*) 25 per cent. of minimum specified room-temperature tensile strength; (*b*) 25 per cent. of the tensile strength at temperature; (*c*) 62½ per cent. of yield strength at temperature; (*d*) a conservative average of the stress to give a creep rate of 0.01 per cent. per 1,000 hr. equivalent to 1 per cent. plastic strain in 100,000 hr.; (*e*) 60 per cent. of the average or 80 per cent. of the minimum stress to cause rupture in 100,000 hr.

It is thus apparent that the engineer makes allowance for the creep that occurs in steel. To do this, he requires to know accurately the creep properties of any given steel over the duration of intended service. More specifically these properties are the stress to cause a specific amount of deformation and/or rupture in a specific time and the ductility at rupture, both properties being required at the temperature of intended service.

Fig. 3 illustrates these properties. It is of importance to note the ductility curve. With increase in testing time the ductility at rupture falls to some minimum value and intercrystalline cracking may be introduced. The minimum value attained depends upon the chemical composition and prior heat treatment. In some alloys the value can be very low and elongation values between 1 per cent. and 5 per cent. are not uncommon.

An arbitrary value of 5 per cent. elongation is widely acknowledged as a desirable minimum value. It is often argued that such a level is unnecessarily high when design is based on, say, the attainment of 0.1 per cent. creep strain. The main reason for it, however, is to accommodate localized stress concentrations which are likely to be present in all designs and it can therefore be looked upon as a built-in safety factor.

The determination of these properties is generally left in the hands of the metallurgist, as are the other aspects of the subject which are the development of new alloys and the determination of the general "know-how" of the materials.

Metallurgical Aspects

The work of the ferrous metallurgist on the subject of creep falls into three categories:— (1)

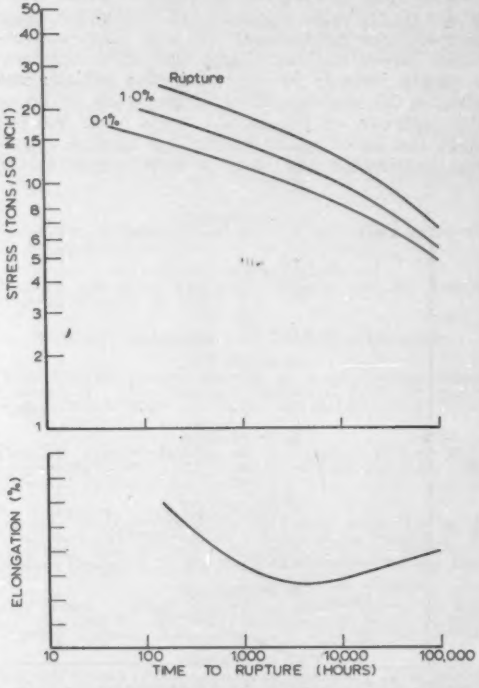

FIG. 3.—TYPICAL PATTERN OF STRESS-TO-RUPTURE AND DUCTILITY PROPERTIES OF STEEL.

Fundamental work; (2) development of new alloys; (3) the collection of standard data.

Fundamental Work.—This is a most important aspect and covers the examination of the effect of chemical composition, steelmaking procedures, heat treatment, and structure on the creep and rupture behaviour. In scientific terms this consists of investigating the effects of interstitial elements (*e.g.*, nitrogen and boron). solute atoms and the allotropic transformation from $\gamma \rightarrow \alpha$ iron.

It is important to note that the wide range of strength properties which can be obtained in a steel at room temperature are to a large extent governed by an allotropic change. The temperature at which this allotropic change occurs controls the subsequent microstructure of the steel, and, in turn, the change temperature is controlled by chemical composition and heat treatment. By further adjustment to chemical composition and heat-treatment hard carbide particles (or intermetallic compounds) can be made to precipitate from the solid solution. Just as reinforcing bars strengthen concrete so carbide particles strengthen steel.

The effect of interstitial elements in steel has in recent years assumed considerable importance. With respect to creep properties the large variation in the properties of aluminium-treated steels has now been shown to be due to the presence of nitrogen and the reaction between nitrogen and aluminium.

Fig. 4 summarizes the work that has been done and shows the relationship between the creep strength and the active nitrogen content. A considerable amount of metallurgical investigation has gone into this topic and it is now clear that the mechanism is one of nitrogen atmospheres, *i.e.*, the nitrogen atoms cluster around dislocations and

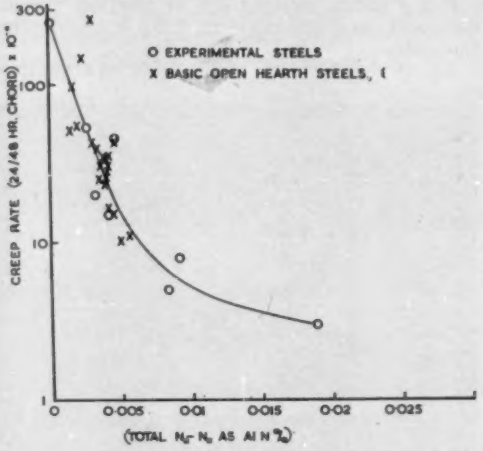

FIG. 4.—RELATIONSHIP BETWEEN CREEP RESISTANCE AND ACTIVE NITROGEN CONTENT FOR CARBON STEEL. TEST CONDITIONS. 8 TON/SQ. IN. AT 450 DEG. C.

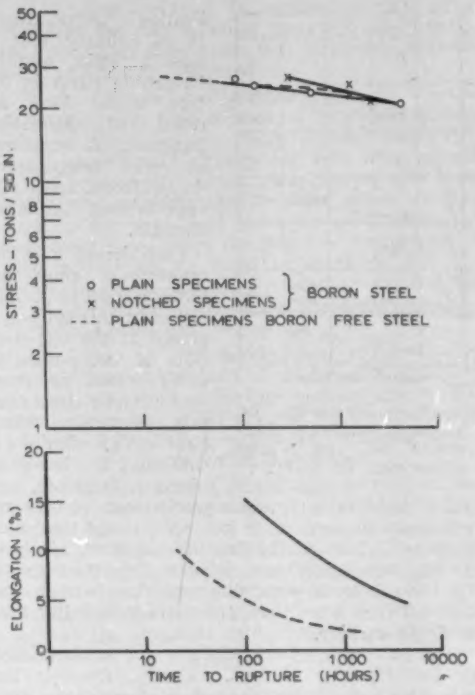

FIG. 5.—STRESS-TO-RUPTURE DATA FOR BORON AND BORON-FREE STEELS.

hinder their movement in a similar manner to that described by Cottrell and Bilby for the yield point phenomena.

Boron also has been shown to have a very marked effect on creep properties and Fig. 5 shows its effect on a low-alloy steel which is commonly used for bolting applications. The main effect to note here is the improvement in the creep ductility that has been brought about by the addition of 0.005 per cent. of boron.

The effect is of a transitory nature and, while no metallographic evidence is yet available to explain it, it would appear to be due to the segregation of boron atoms to the grain boundaries. Such a feature would affect the over-ageing tendencies in such regions and therefore the intergranular cracking behaviour.

Next consider the effect of solute atoms. This can be conveniently sub-divided into the effect on solid solution hardening and the formation of precipitates, *e.g.*, carbides, nitrides and intermetallic compounds. Here reference must be made to the classic work of Austin Lindsey and St. John. These workers studied a series of binary alloys in which Mo, Cr, Mn, Si, Ni, and Co were alloyed with iron. Fig. 6 shows the solid solution hardening effect of these elements. The authors attributed this effect to increases in the recovery and recrystal-

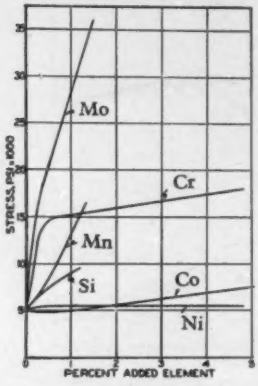

FIG. 6. — INFLUENCE OF VARIOUS ALLOYING ELEMENTS ON THE CREEP RESISTANCE OF STEEL.

lization temperatures. It is unlikely that it was a solid solution hardening effect in the true sense since the order of increasing hardness, as measured at room temperature, was different from that appertaining to creep strength.

Considering now the question of alloy carbides, a most important aspect of this subject, a glance at the composition of creep-resisting steels serves to show that all such steels contain elements which have a high affinity for carbon. It is quite obvious, therefore, that alloy carbides and other precipitated phases are extremely important. It has been stated that such carbides should (*a*) be initially coherent, (*b*) have a high resistance to deterioration over-ageing, (*c*) form in even dispersion with fine particle size, and (*d*) that more than one carbide is better than a single carbide.

The formation of a precipitate can be considered as a three-stage process. Firstly, there is the clustering of atoms around a favourable site, then the ordering of these atoms into coherency with the matrix and, finally, the formation of a foreign particle which is initially coherent. This process introduces a considerable internal strain into the matrix lattice and this strain effect will persist until the precipitates lose coherency and agglomerate to form larger particles.

Fig. 7 shows evidence of this lattice strain in an aluminium 4 per cent. copper alloy. This effect has not yet been found in steel. This electron micrograph was obtained from the examination of a thin foil of this alloy in a high-resolution electron microscope. The points to note are the light and dark areas where the initial stages of precipitation are occurring. Nutting has stated that these dark areas are undoubtedly strain fields. Once the particles are well formed a dispersion effect occurs and obviously the more numerous the particles the more effective they are.

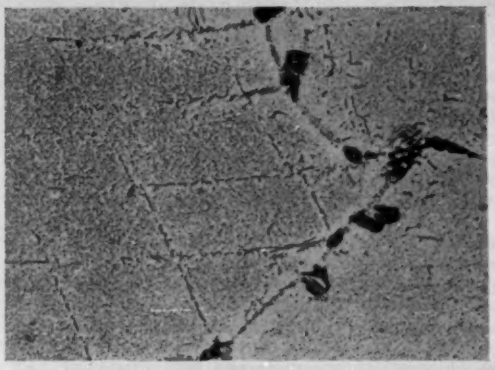

FIG. 8.—PRECIPITATION OF ALLOY CARBIDES AT DISLOCATION LINES THAT HAVE GENERATED FROM BOUNDARY DEFECTS.

Figs. 8, 9, and 10 show the precipitation of alloy carbides in creep-resisting steels and in most cases this precipitation has occurred during the creep process.

Fig. 8 shows how precipitates have formed on dislocation lines that have generated from boundary defects.

Fig. 9 shows precipitation on piled up dislocations and the commencement of an intercrystalline fracture.

Fig. 10 shows general p[illegible]ation on dislocation

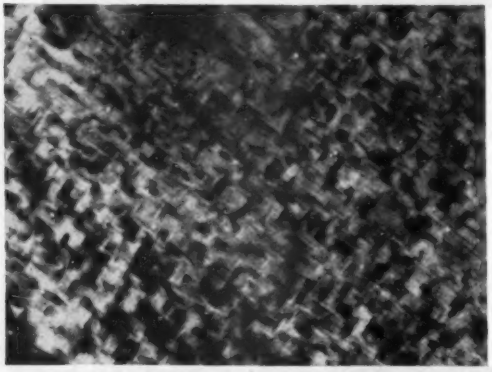

FIG. 7.—EVIDENCE OF LATTICE STRAIN IN AN ALUMINIUM 4 PER CENT. COPPER ALLOY.

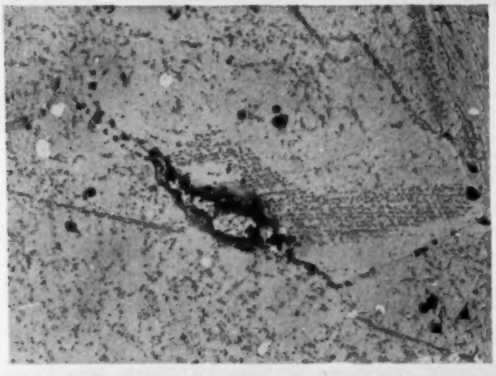

FIG. 9.—PRECIPITATION OF ALLOY CARBIDES ON PILED UP DISLOCATIONS: COMMENCEMENT OF AN INTERCRYSTALLINE FRACTURE IS ALSO EVIDENT.

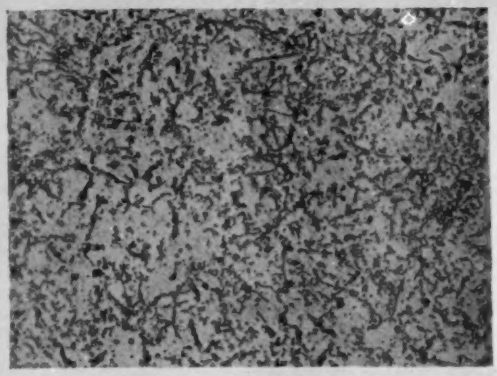

FIG. 10.—GENERAL PRECIPITATION ON DISLOCATION ARRAYS.

arrays and Fig. 11 indicates how the difference in coefficient of expansion between matrix and large carbide particle can generate dislocations into which further carbides can precipitate, thus giving a strengthening effect to the steel.

Finally, with regard to the effect of the allotropic transformation on the creep behaviour of steel, there is, in the published literature, evidence to show that the different structures obtained vary in order of merit depending upon the test temperature at which they are examined. It has been suggested that strain introduced into the lattice by suppressed transformation appears to be a contributory factor to improved creep resistance. There must be other factors since different structures of the same hardness give creep strengths.

Stability of structure is obviously important and it would be logical to assume that the most stable structures for a given test temperature would be those formed at or above that test temperature. While it is established that high-temperature strength is affected by differing transformation structures, there is also much evidence that indicates that such effects are of a transitory nature. This is to be expected since given sufficient thermal activation all non-equilibrium structures will strive to attain equilibrium.

Possibly the most important aspect of the allotropic transformation is in those steels which exhibit strong carbide-forming tendencies, in particular those steels containing vanadium. It has been shown by detailed metallurgical examination that the intensity of the precipitation of alloy carbides is related in part to the temperature of the allotropic change.

Development of New Alloys.—Since the end of the war the main need for new creep-resisting steels has arisen from the rapid development of the gas-turbine engine. More recently the fact that temperatures in conventional power plant have exceeded the limit for low alloy steels has stepped up this need. Fortunately, the lessons learnt from one development can be applied to the other. However, the very different operating conditions of the two plants does mean that in general different types of alloy are required.

Steels for the gas turbine must be capable of carrying very high stresses for very short periods, whereas those for the steam turbine must withstand much lower stresses for very long periods. With respect to gas-turbine alloys and confining our considerations to those alloys of more than 50 per cent. iron there are now alloys that will carry three times the stress or operate at 150 deg. to 200 deg. C. higher than alloys that were available at the end of the war. Similar strides have been made in those steels primarily intended for power-plant use.

Obviously in the development of new alloys metallurgists must have available the results of fundamental work of the type outlined above. With this information at his disposal he must adjust his chemical composition to give the combined level of strength and ductility that is required.

At the same time it should also be realized that, while he might be developing a steel to resist creep deformation, it is also likely that the steel must be readily weldable, easy to fabricate by bending and drawing and to be capable of meeting some definite tensile-strength requirements. In other words, he is seeking a compromise and the evaluation of the chemical composition is possibly only half of the job. While the correct composition is extremely important, it is also possible that slight changes to manufacturing technique can make better use of the alloy content than if pre-existing procedures were adhered to.

Fig. 12 illustrates the manner in which the chemical composition for creep-strength requirements can be obtained. It is in the form of an isometric plot in which molybdenum and vanadium

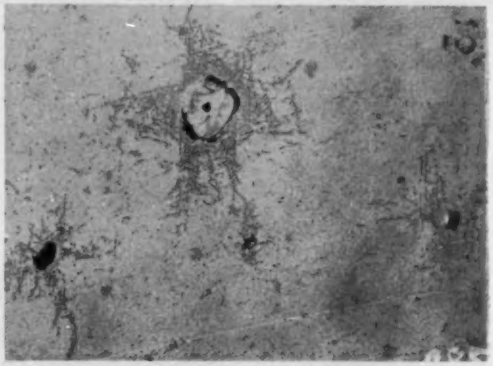

FIG. 11.—INDICATION OF THE GENERATION OF DISLOCATIONS CAUSED BY DIFFERENCE IN COEFFICIENTS OF EXPANSION OF MATRIX AND LARGE CARBIDE PARTICLE. FURTHER PRECIPITATION OF CARBIDES AT THESE DISLOCATIONS CAN OCCUR TO GIVE A STRENGTHENING EFFECT TO THE STEEL.

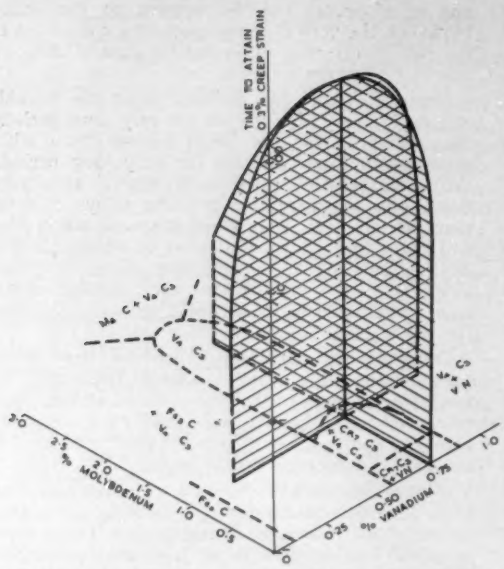

FIG. 12.—ISOMETRIC PLOT SHOWING THE MO AND V CONTENTS OF STEEL AS A FUNCTION OF THE TIME TO ATTAIN 0.3 PER CENT. CREEP STRAIN. THE LETTERING AT THE BASE DENOTES THE ALLOY CARBIDES THAT FORM.

are shown as a function of the time to reach some creep criterion.

At the base of the diagram are shown the types of alloy carbide that form and it will be noted that the strongest alloy contains 1 per cent. Mo and 0.75 per cent. V. This alloy is just inside the phase field for chromium carbide and vanadium carbide. This alloy also contains 0.2 per cent. carbon and 1 per cent. chromium. The carbon content was fixed so as to develop the correct tensile strength and the chromium content was selected to promote better ductility and reduce the risk of graphitization. Having obtained this composition, a great deal of research effort was expended in producing the steel in an economical manner.

Initially in production a prohibitive percentage of bars produced were rejected due to surface defects.

It was only after many months of experiment that the correct heating, hot working, and cooling cycles were evolved which sufficiently reduced the high rejection rate to make the alloy an economical proposition. In building a house it is said that the task is 50 per cent. complete when the roof has been put on. Similarly with a new alloy, its development is 50 per cent. complete once a composition has been evaluated from laboratory experiments.

The Collection of Standard Data.—Under the section relating to engineering aspects it was mentioned that the design engineer must know the properties of a given steel in some detail. Where steels are to be used at room temperature the creep phenomenon does not apply and it is relatively easy to determine typical strength properties. All that is required is to test a sufficient number of different heats to give a statistically significant result.

At temperatures at which creep occurs it must be remembered that the properties depend upon the time period considered. If the properties are required for, say, power-plant equipment where the service life is considered to be in excess of loads to cause rupture in approximately 300, 1,000, hr. translated to service performance means upwards of 15 years.

For continuous running it is approximately 11 years and obviously the determination and the extension of tests to such times is from many points of view prohibitive.

Up to the last 10 years, and in some instances today, some design engineers were content to determine the long-term properties on the basis

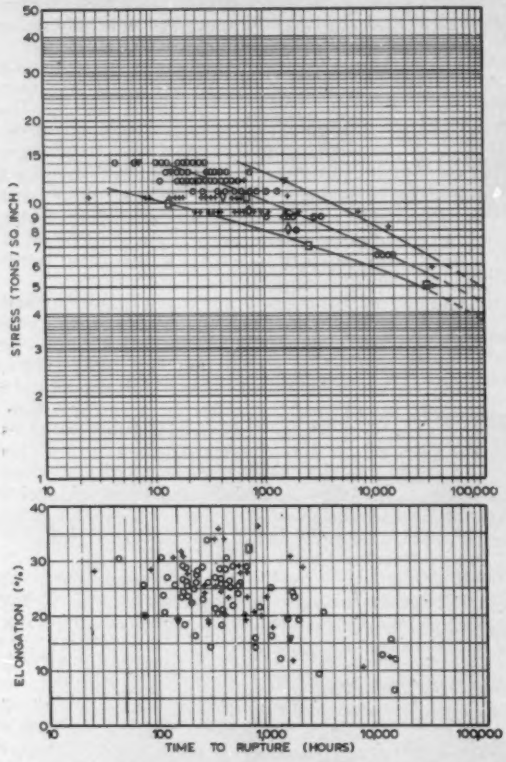

FIG. 13.—TYPICAL TEST DATA REQUIRED ON A STEEL FOR LONG-TERM APPLICATIONS. IN THIS CASE THE STEEL WAS CRMO AND THE TEST TEMPERATURE 1,050 DEG. C.

of tests of only 1,000 hrs.' duration. With more knowledge of the subject this procedure is now dying out and, with respect to this country, in the past year a British Standard has been evaluated which lays down the procedures that may be adopted. These are as follow:—

(*a*) When a steel made by more than one steelmaker is to be tested, samples from a minimum of three separate casts from each steelmaker shall be taken. At each temperature of testing, testpieces from each cast shall be tested at constant loads to cause rupture in approximately 300, 1,000, and 3,000 hr. At each of the test temperatures, testpieces from at least two of these casts from each steelmaker shall be ruptured in 10,000 and 30,000 hr. approximately, and one testpiece per steelmaker from one of the above two cases shall be ruptured between 50,000 and 100,000 hr.

(*b*) When a steel made by only one steelmaker is to be tested, the minimum number of casts shall be six. At each test temperature, testpieces from each cast shall be tested at constant loads to cause rupture in 300, 1,000, and 3,000 hr. At each of the test temperatures, testpieces from four of these casts shall be ruptured in approximately 10,000 and 30,000 hr., and testpieces from two of the casts of the four mentioned above shall be ruptured between 50,000 and 100,000 hr.

(*c*) In general, at least three test temperatures shall be chosen covering the temperature range within which the rupture properties are likely to be the main basis of design. The temperature of testing shall be a multiple of 25 deg. C. or 50 deg. C., preferably the latter. The stresses shall be reported in ton/sq. in. and shall preferably be a whole number.

Fig. 13 shows typical data required on a steel that is to be used in long-term applications. This data was not obtained on the basis outlined above, but is a collection of all the data that happened to be available in this country. The tremendous effort that must be expended in determining realistic properties will be appreciated from Fig. 13. It will now be readily appreciated why modern creep laboratories are expanding at the high rate indicated in Fig. 1.

EARTHMOVING EQUIPMENT

CORRECT handling of heavy constructional equipment is featured in a film produced by Michigan (Great Britain), Limited. In this 16-mm. film, which is in full colour, operatives are shown how to avoid unnecessary accidents and assistance is given to those concerned in ensuring that the high productivity rate of Michigan tractors is set and maintained.

Also available from the company are four other films featuring rubber-tyred tractor dozers, pipe handling by mechanical means, tractor shovels in action, and Michigans at work on the Doncaster by-pass. The films may be borrowed by professional institutes and users of Michigan tractors; inquiries should be made to Michigan (Great Britain), Limited, Yorktown Works, P.O. Box No. 3, Camberley (Surrey).

Metallurgical Advances Aid Plant Development

ADVANCES in the field of metallurgy had played an increasingly important part in the overall development of the present-day design of large power units, said Mr. J. B. Woodeson in his presidential address to the North East Coast Institution of Engineers and Shipbuilders on October 17.

In the continuous quest to raise the efficiency and lower the costs of steam power plants a steady increase in operating temperatures and pressures had become necessary. Each rise in temperature and pressure had created a new challenge in materials selection. The development of satisfactory high-temperature steels to meet those difficult conditions was of prime importance, and great progess had been made. In this country, steam-raising units were to be constructed which would have an operating pressure of 3,650 lb./sq. in. g. at 600 deg. C. and in the US units such as the Eddystone plant would operate at 5,000 lb./sq. in. g. and 650 deg. C.

For metal temperatures up to about 450 to 480 deg. C., mild steel could be used in superheaters and reheaters. Above that temperature the scaling of mild steel became excessive; also, the strength for a given cross-sectional area deteriorated rapidly. For that reason, at steam temperatures above 450-480 deg. C. low-alloy steels with small additions of chromium and molybdenum, having the requisite strength and scaling resistance were used. Those materials came under the general heading of ferritic steels. In the temperature range of 575 to 675 deg. C. completely different types of steel were necessary. They were austenitic steels containing substantial additions of chromium and nickel and in some cases molybdenum and other trace elements. New alloys were now being developed for temperatures above 675 deg. C. and in the reasonably near future the general adoption of steam temperatures of that order might be envisaged, Mr. Woodeson said.

School of Welding Technology Courses

DETAILS of the courses which are being offered by the School of Welding Technology between November, 1960, and March, 1961, are given in a prospectus. The School of Welding Technology was established by the Institute of Welding three years ago.

The prospectus is available from the institute at 54, Princes Gate, Exhibition Road, London, S.W.7.

IRON-ORE EXPORTS from Chile in the first half of 1960 amounted to 1,844,000 tons. The year's total is estimated at 4,000,000 tons, of which more than half will have been provided by Cia Minera Santa Fe.

New Literature

INCLUDED among the new catalogues, booklets, and other publications which have recently been received are those mentioned below. Readers wishing to obtain a copy of any of the publications referred to should apply direct to the address given, at the same time mentioning IRON AND COAL.

JELTEK, LIMITED, Green Lane, Hounslow (Middx)—Details of the company's protective clothing, including the latest price-list, are given in three pamphlets.

J. BROCKHOUSE & COMPANY, LIMITED, 25, Hanover Square, London, W.1—A trenchant article on "Operation Export" is contained in the October-December issue of The Forge. There is news of the first British-made Lester injection moulding machine, of a new car transporter, and of the increasing use of "Soundmaster" doors to reduce noise penetration.

SKEFKO BALL BEARING COMPANY, LIMITED, Luton—The Ball Bearing Journal is a quarterly review of rolling bearing engineering. The latest number (No. 2, 1960) contains articles on "SKF Specialities for the Textile Industry" (a continuation from the previous issue), "Suspension Bearings for German Tramcar Motors." and "Heavy Plate Levelling Machine."

MASCHINENFABRIK UND EISENGIESSEREI A. BEIEN, Herne/Westphalia—The mining machinery firm of Beien has been established for 75 years and a brochure has been produced to commemorate the event. Equipment for the mining industry has been manufactured from the start. The number of employees has increased from about 30 in 1885 to almost 1,000.

MONSANTO CHEMICALS, LIMITED, Monsanto House, 10-18, Victoria Street, London, S.W.1—Monsanto Mail is a particularly bright and attractive publication. Issue No. 6 contains, among other interesting features, an open letter from John Davy, science correspondent of The Observer, to the Minister for Science. If you like pictures in colour, you'll like the Monsanto Mail.

TANGYES, LIMITED, Cornwall Works, Smethwick, Birmingham—One and All is the title of a periodic review for the company's agents. No. 25 of which has just been issued. A wide range of Tangye equipment is covered in the magazine, including climbing jacks, hydralites used in the lift-slab method, the bolt tensioning jack, presses, pumps, and testing machines. The layout is attractive.

VULCAN BOILER & GENERAL INSURANCE COMPANY, LIMITED, 67, King Street, Manchester 2—The October issue of Vulcan—the Voice of Experience, a quarterly journal for power users, includes articles on "The Turbine that Went Wrong." "When Stress Lets in Corrosion." "The Benson Boiler," and "The Crane that Lurched." There is also a contribution on accidents due to shortage of water in boilers.

GLOVER & WOOD, LIMITED, Dept. "B," Victoria Works, Leeds 11—Details of a very wide range of industrial protective clothing and safety equipment are contained in the company's latest list. In fact, the day-to-day operating needs of all industries are covered and large stocks are maintained in order to effect immediate delivery. This very comprehensive list will be found invaluable as occasion arises.

HEAD WRIGHTSON PROCESSES, LIMITED, 20-24, Old Street, London, E.C.1—Two new brochures have been issued by the company's water treatment division, one covering deaeration equipment and the other giving details of filtration plant. This equipment is manufactured under licence to the Belco Industrial Equipment Division, of New Jersey, and the leaflets are intended to acquaint customers with the type of equipment and processes that can be offered in these fields.

MITCHELL ENGINEERING, LIMITED—Publication of the third quarter, 1960, number of Impulse has been delayed by circumstances beyond the control of the publishers. Covering science, art, and industry, it is published by Journal Press, Limited, 5 and 6, Clement's Inn, London, W.C.2, under the sponsorship of Mitchell Engineering. If your interests lie in the field of metallurgy, H. M. Finniston's article on "Control of Metal Properties" will appeal. But we have no hesitation in advocating the expenditure of 5s. (by post 5s. 9d.) to anyone who is interested in only one of the three subjects mentioned above.

RICHARD THOMAS & BALDWINS, LIMITED, 82, Brook Street, London, W.1—Peter Hewitt writes the story and supplies the pictures for "Swedish Ore in Transit," featured in the October issue of Ingot, the RTB quarterly magazine (6d.). From the mines in the mountains of Swedish Lapland to the blast furnaces in the RTB's Ebbw Vale Works come thousands of tons of iron ore every year, and when the new Spencer Works is operating, the volume of traffic will no doubt increase. Mr. Hewitt records the background to this important facet of the story of "demand and supply" in the steel industry most attractively. There are various other features, of course; in fact, Ingot is indeed a magazine to be read "from cover to cover."

QUALITY CONTROL SYMPOSIUM

RECENT symposium on quality control, held in London and organized by the quality control instruments division of Elliott Bros. (London), Limited, a member of the Elliott-Automation group, to introduce its wide range of quality control instrumentation, was attended by over 200 people.

The following papers were presented and discussed:—"Applications of On-stress Analysis Instruments to Control in the USA," by Dr. D. J. Fraade; "The Use of an On-stress Analyzer and Optimat Controller in Optimizing the Performance of a Distillation Column," by J. Barnes, and "In-line Blending Systems Employing Continuous Control of Viscosity or Density," by R. L. Botting.

Copies of the papers are available from Elliott-Automation, Limited, 34, Portland Place, London, W.1.

A Silver Jubilee

Part of the celebration of the silver jubilee of the Star Aluminium Company, Limited, 97, Penn Road, Wolverhampton, is the publication of an elaborately produced brochure. Much of the book is concerned with the production of Star foil and its many uses, but space has been devoted to many of the personalities associated with the company on its management and production sides at Wolverhampton and Bridgnorth during the first 25 years.

S & L's Clean Conditions Plant

Installation at Tollcross Works

ONE of the largest steel tube manufacturers in the world, Stewarts and Lloyds, Limited, has recently formed a pipework engineering division to concentrate on the fabrication and manipulation of various types of products from tube. Nuclear reactor components are among the most interesting of these products and a good example is provided by the 424 control rod standpipes now being made at the Tollcross Works in Glasgow.

This order, from the Motherwell Bridge & Engineering Company, Limited, is worth several hundred thousand pounds and is for the Hunterston nuclear power station now being constructed on the Ayrshire coast by the GEC and Simon-Carves Atomic Energy Group for the South of Scotland Electricity Board.

Governing Reactor Power Level

These standpipes are the means by which the reactor power level is governed. Through them are introduced rods containing boron which absorb neutrons to control the rate of reaction. They also carry the "burst cartridge detection" tubes which extract gas samples to detect ruptured uranium fuel element cans. Each of these 32-ft. long standpipes consists of 63 tubes assembled to a very high degree of straightness, various cavities being filled with high-density barytes concrete to act as biological shielding.

A requirement of all reactor components is that they must be scrupulously clean because certain elements present in dirt or dust particles could damp down the reaction and also make the gas stream radioactive. The original concept of clean conditioning was that, in general, it would be carried out within the reactor during erection. Increased complexity in the design of components has, however, resulted in that being impracticable in many cases. Consequently, it has become more general for components to be clean conditioned at the works before despatch to site.

The form of clean conditioning which Stewarts and Lloyds employs at Tollcross consists of degreasing, shotblasting, and vacuum-cleaning the component parts, followed by the application under dust-free conditions of a protective coating to prevent rusting. This coating has to be of a material which will not show any undesirable effects under heat or irradiation and the plant at Tollcross provides for dipping parts in any of the three liquids generally used—"Trilac" or clean condi-

A General View of the Assembly Compartment of the CLEAN CONDITIONS SHOP at the TOLLCROSS WORKS of the Pipework Engineering Division of STEWARTS AND LLOYDS

PRESENT WORK IN PROGRESS, ILLUSTRATED HERE, IS THE ASSEMBLY OF CONTROL STANDPIPES FOR THE HUNTERSTON NUCLEAR POWER STATION.

tions primers "P.A.20" or "P.A.21." Clean conditioning of the parts is followed by assembly under dust-free conditions and sealing of the assembled components before removal from the clean shop.

The clean shop at Tollcross is a building within that part of the main building used for nuclear engineering work. The clean shop itself has a floor area of 7,000 sq. ft. and is divided into two main compartments, one for vacuum-cleaning and dipping the parts in protective coating and the other for final assembly. It is of dust-proof construction with double-glazed windows and rubber-edged doors.

The floors have a special surfacing and the rest of the interior is finished with a special gloss paint which is free from any constituents which might contaminate the products. Electrically heated and very highly filtered air is supplied under pressure. Personnel enter through a changing room and wear special white overalls, caps, gloves, and rubber boots.

An interesting feature is the way in which plant layout and mechanical handling aids have been arranged so that delays and handling between successive cleaning operations are minimized. This is an important requirement in clean conditioning to avoid incipient rusting and contamination between the first cleaning operation on a part and the application of its protective coating. Adjacent to the clean shop entry doors are the two degreasing units and the specially designed shotblast unit. From these plants, electric monorail hoists run into the clean shop, over the dipping bath, and throughout the final assembly compartment. Between hoisting stations, parts are rolled along rubber-lined skids.

The clean shop and its associated plant have been fully approved by the United Kingdom Atomic Energy Authority. When first faced with the need for clean conditioning and clean assembly, Stewarts and Lloyds decided on a large permanent clean shop planned for maximum versatility rather than a smaller temporary structure to suit the immediate requirements. As a result it has a clean shop which is outstanding in this class of industry and with which it is particularly well equipped for the manufacture of a wide variety of reactor components and the increasing number of other products requiring clean conditions.

Mining Technical Magazine

Included in the 1960 issue of the Mining Technical Magazine, published by the University of Birmingham Mining Society (price 5s.), is an article on "Reconstruction" by Mr. W. V. Sheppard, the National Coal Board's director-general of production and reconstruction. Mr. Andrzej A. Battaglia, formerly of the Department of Mining at Birmingham University and now Professor of Mining and Metallurgy at Crakow, Poland, has a contribution on "Some Remarks on the Application of Centrifugal Force for Coal Preparation," while Dr. A. A. Hirst, deputy director (coal preparation), Central Engineering Establishment, NCB, writes on "Some Problems Associated with Coal Preparation Development."

TESTING OF STEEL

RECOMMENDATIONS on the testing of steel made by the International Organization for Standardization have been published by the British Standards Institution.

They bear the following titles, and are obtainable from the BSI Sales Branch, 2, Park Street, London, W.1, at the prices stated. Their content substantially agrees with published British Standards of similar title.

ISO/R79, Brinell hardness test for steel, 5s. 8d.

ISO/R80, Rockwell hardness test (B and C scales) for steel, 5s. 8d.

ISO/R81, Vickers hardness test for steel, 5s. 8d.

ISO/R82, Tensile testing of steel, 10s. 2d.

ISO/R84, Izod impact test for steel, 9s.

ISO/R85, Bend test for steel, 5s. 8d.

ISO/R86, Tensile testing of steel sheet and strip less than 3 mm. and not less than 0.5 mm. thick, 6s. 9d.

The ISO recommendations also include the following, similarly available from the BSI:—

ISO/R83, Charpy impact test (U notch) for steel, 5s. 8d.

ISO/R87, Simple bend testing of steel sheet and strip less than 3 mm. thick, 4s. 6d.

ISO/R88, Reverse bend testing of steel sheet and strip less than 3 mm. thick, 4s. 6d.

ISO/R89, Tensile testing of steel wire, 5s. 8d.

Symposium on Welding in Shipbuilding

CO-OPERATING with the Institute of Welding in a symposium on "Welding in Shipbuilding," to be held in London in October-November, 1961, are the Royal Institution of Naval Architects, the Institution of Engineers and Shipbuilders in Scotland, and the North East Coast Institution of Engineers and Shipbuilders.

The Joint Symposium Committee invites offers of papers on:—"The Structural Design of Welded Hulls"; "The Building of Welded Ships"; "Shipyard Layout for Welded Shipbuilding"; "Automatic Welding in Shipbuilding"; "Materials Handling"; "Welded Joints in Thick Mild Steel"; "The Use of High Yield Point Steels in Welded Ship Construction"; "Aluminium Alloys for Welded Ship Construction"; "Non-destructive Testing of Ship Welds"; "Training and Testing of Ship Welders."

The MSS (complete with illustrations) will be required by April 1, 1961. The preferred length of papers is 2,000 to 3,000 words. Offers of papers, which should include a synopsis of not more than 200 words, should be addressed to the Secretary, Joint Symposium Committee, Institute of Welding, 54, Princes Gate, Exhibition Road, London, S.W.7, and should reach the institute before the end of November, 1960.

Confidence that the coal industry would retain its place "as an indispensable asset to this country's economy" was expressed by Sir James Bowman, chairman of the National Coal Board, when he gave a short address to members of the North of England Branch of the National Association of Colliery Managers on September 14. He referred to "the spirit of management" and "its ability to respond to the challenge of nature and national needs." In the discussion that followed, Sir James had something to say about the attitude of some sections of the Press towards the NCB.

TESTING TIME FOR COAL

Management's Vital Part in Industry's Future

By SIR JAMES BOWMAN

LOOKING back over the period since vesting date, the coalfields of Northumberland and Durham have made as positive a contribution to the success of the coal industry as any of the divisions of the National Coal Board. Not only has efficiency risen remarkably in the face of natural difficulties, but these two coalfields have suffered far less than almost any other from industrial disputes—a tribute to the tact of management and the quality of trade union leadership.

The past few years have seen a period of severe recession in the demand for coal, which has taxed the industry with serious problems. In retrospect, the extent and complexity of the difficulties that have been overcome are severe indeed. Yet, by the end of 1959, production and demand had been brought into balance, and this year production policies have been so managed that there will be a net reduction in stocks. Since 1957, 125 collieries have been closed and manpower has been reduced by over 110,000 men, and these steps have been taken without inflicting serious hardship on the mining communities. But even while these drastic measures were being taken, stocks had to be built up to 36,000,000 tons at the end of 1959.

Competition from Oil

It quickly became clear that competition from oil was by far the most serious factor in the fall in demand for coal and that the oil companies were eating into traditional markets for coal at an alarming rate. In the first six months of this year oil was replacing coal at the annual rate of 38,000,000 tons, an increase of 22,000,000 tons over 1956.

In meeting this challenge, great strides have been made in increasing productivity. Output per man-shift rose by 5.3 per cent. last year compared with 1958, and so far this year has risen a further 3½ per cent. These advances have been made possible by tremendous efforts by management, and Northumberland and Durham have played their full part in this great improvement in efficiency. Comparing estimates for next year with 1958, savings as a result of economies and increased efficiency will amount to some £60,000,000 a year.

The prospects for the long term are that a solid nucleus of the industry will be devoted to supplying the demand for steam-raising coals for electricity generation. Demand for coal in power stations may rise into the region of 80,000,000 to 90,000,000 tons in the late 1970s, compared with 46,000,000 tons last year. The great quantity of untreated small coal required by power stations is precisely the kind of product that reconstructed, highly mechanized pits are best suited to produce, and as the proportion of our total output going to this market rises to almost half, the use of laborious and old-fashioned mining methods will dwindle.

From 1965 onwards, providing industrial activity continues at a high level and the economy expands at the forecasted rate, coke ovens should consume at least 35,000,000 tons a year, compared with 27,000,000 tons in 1959. The demand from the domestic market for coal and premium solid smokeless fuel in 1965 should be in the region of 27,000,000 tons a year. But in markets such as the gas industry, the railways, general industry, and miscellaneous users, where oil has made headway, it must be accepted that some decline is inevitable.

In the field of solid smokeless fuels, which will become increasingly important as clean-air zones spread, work is going ahead with a pilot plant at Birch Coppice, where smokeless briquettes are made from small coals by the hot briquetting of fluidized char. Small batches of fuel will be tested on the market this winter; if the plant is successful, plans will be ready for the erection of a large-scale commercial plant.

If the coal industry is to compete and maintain its position in the markets for fuel in this country, it is inevitable that there will be some contraction for the total size of the industry, and a concentration on the most efficient, low-cost producing collieries. To achieve the two main objectives—of

producing coal at levels of efficiency high enough and levels of cost low enough to compete with the oil companies, and of marketing the industry's products in the form and consistant quality demanded by consumers—a tremendous and sustained effort will be needed from all levels of management in promoting efficiency and in paying closer attention than ever before to the crucial factor of quality control.

The future will undoubtedly be a testing one, but the spirit of management in this industry and its ability to respond to the challenges of nature and national needs give one confidence that the coal industry will retain its place as an indispensable asset to this country's economy.

DISCUSSION

Opening the discussion, MR. C. R. KNAGGS asked Sir James if he thought that the board had answered sufficiently strongly the "sniping" of the Press and the public against the board's efforts.

SIR JAMES said that this was one of the most difficult problems facing the chairman and his colleagues on the National Coal Board. "Although statements made in the Press can often be readily contradicted, the difficulty is that what has already been said has, by the time anything can be done, already made its impact on a wide reading public," he said.

MR. F. H. BAKER asked to what extent were the alternative steps being taken by the North Thames Gas Board, or any other Gas Board, to use fuels other than oil related to its difficulty in disposing of the coke which it made from its gasification of coal. Replying, SIR JAMES said that, while the disposal of coke was a major contributory factor, it appeared from discussions with the Gas Council that the main consideration was the relative cost of making gas from oil products and from coal.

MR. J. C. STALKER invited Sir James to comment on the advantage taken by the Central Electricity Generating Board of the difficulty in disposing of small coal. It appeared that it was getting the coal at a low price because it cost so much to stock. It seemed unfair that one nationalized industry should take advantage of another which was suffering embarrassment.

SIR JAMES BOWMAN said that the NCB had persuaded the CEGB to agree to increase its stocks above the normal level in return for a rebate on the extra coal taken. This was a satisfactory arrangement from the NCB's point of view, as it reduced the level of stocks which had to be held at the collieries.

When MR. F. C. CHAPMAN asked how far Sir James envisaged that method study should be used in power-loading installations, and whether, from his experience of other divisions, the incentive bonus was the "carrot" to get the best results, SIR JAMES said that in the East Midlands Division, method study of power-loading installations was carried out with the co-operation of the unions. There were similar arrangements in South Wales. Method study had considerable advantages in this field, but it would be unwise to press on with its use without first being sure of the co-operation of the unions. Ideally, one would ultimately like the incentive to produce good results to be provided by pride in performance, allied to a good day wage, and if such a system could be satisfactorily introduced this might be a more contented industry. But it was not possible to generalize and in some cases financial incentives might be necessary.

MR. W. S. FOSTER, who said that a lot had appeared in the Press about the unions fulminating against excessive decentralization, asked if there was anything in that and, if not, why had the board not said something about it? "As far as the board is concerned, there have been no thoughts whatever about decentralization," said SIR JAMES. "The Fleck Committee in its report said that it agreed that the board had been too often subjected to ill-informed criticism without proper inquiry, and suggested that when its findings had been applied there should be a period during which the industry should be left alone to settle down and get on with its job." There had been rumours of decentralization, he said, but they had not be associated with the board, but with the Government.

MR. W. J. CHARLTON said that Sir James had mentioned the contraction of the industry to make it more efficient. "My principal interest is the Northumberland coalfield and I see that the proceeds from our small coal are declining and we are meeting with great competition from coalfields which, perhaps, have more favourable circumstances," he said. "I am wondering whether, in its contraction and in its competition for small coal markets, resulting in further closures, to what extent we in Northumberland may fear a severe blow, which could be catastrophic."

SIR JAMES BOWMAN, in reply, said that in 1958 the Northern (N & C) Division was producing 13,000,000 tons. The "Revised Plan for Coal" gave an output for the division in 1965 of between 11,500,000 and 12,500,000 tons. In 1961 the target had been set for 11,800,000 tons. There was a similar picture in Durham. While there might at the present time be some over-production of small coal in certain coalfields, the existing state of affairs could not be exactly described as competition between coalfields. What had happened in some cases was that other coalfields, also with a surplus of smalls, had been better placed geographically, with lower transport costs than Northumberland, to supply the existing markets.

With the expanding demand from the electricity industry, the outlook for the sale of smalls in the long term was bright, Sir James continued. By the late 1970s the Central Electricity Generating Board might take up to some 90,000,000 tons of smalls, which might represent almost 50 per cent. of the total output of coal. Smalls could be produced at a very high o.m.s. by means of powder loading, and if power stations could be sited close to highly mechanized pits, with the coal delivered direct by conveyor belt, coal could be produced and delivered at extremely high efficiency.

MR. A. CLARKE wanted to know how much the National Board was inhibited in its sales campaign by the thought of parliamentary repercussions and to what extent it was inhibited by the terms of the Nationalization Act now that coal was in competition with oil.

SIR JAMES BOWMAN remarked that it was not until 1957 that there was a surplus of coal which would make advertising worth while. The board was not inhibited by statute in its advertising. The National Board is bound under the Nationalization Act to administer the industry and the Minister and Parliament have only certain rights, which are laid down under the Act, including the power of the Minister to give a general directive on a matter of public interest," he said. The only point in the day-to-day administration of the industry which concerned the Minister was the price charged for coal; any other administrative function of the board was its own responsibility. He emphasized that advertising was the board's responsibility alone and not subject to parliamentary control.

Mining Oversea

in which we review, from time to time, interesting mining matters reported by our contemporaries abroad

BED SEPARATION IN LONGWALL FACES

DETAILED investigations in seven longwall faces in the Donetz coalfield to establish the process of bed separation above the working space have been carried out by the USSR Surveyors' Institute.

Vertical holes were drilled 13 ft. deep along each line of props and the position and magnitude of the cavities between the strata were measured.

Most of them arose during caving operations and were found to be mainly due to lateral displacement. It has also been shown that bed separation begins approximately 3 ft. above the roof of the face.—A. A. ORLOV, Ugol, May, 1960.

POLISH MINING PROGRESS

RESEARCH efforts of the Polish mining research institutes over the last 15 years have been directed towards mechanization of coal-getting and loading, roof support, automation and hydraulic mining, and transport. Fig. 1 shows a self-advancing roof support unit which was designed after several years of effort. It is at present in the prototype stage, but the makers, the Piotrowice Engineering Works, are going to equip the first longwall face with this type of support within the next few months.

The same firm also produces three types of single hydraulic props which have passed its works' tests and are now being prepared for field tests underground.—M. BORECKI, Przeglad Gorniczy, March, 1960.

COMPRESSED-AIR OPERATED VALVE

SUITABLE for the conveyance of abrasive matter in suspension is a new type of valve for air or liquid which has been marketed by Dosapro, of Paris. As Fig. 2 shows, the valve consists of only four parts and leaves the full cross-sectional area open for the passage of the fluid. When compressed air is introduced into the annulus around

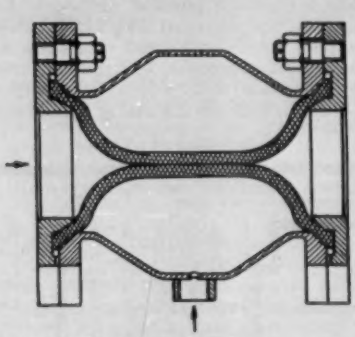

FIG. 2.—CONSTRUCTION OF THE COMPRESSED-AIR OPERATED VALVE.

the rubber sleeve at a pressure 30 lb./sq. in. above that of the conveyed fluid, the valve closes within 1/100th of a sec. The valves are available for bores of 1¼, 2½, 3, 4, 5, 6, and 8 in., but the limiting pressure of the conveyed fluid is at present 60 lb./sq. in.—Annales des Mines de Belgique, March, 1960.

STEEP SEAM MINING

STEEP seams of the Donbass in the USSR are concentrated in its central region. They contributed in 1959 21,600,000 tons of coal, 96 per cent. of which is still won by hand-got methods. Tests with a coal saw, type DGI, have been unsuccessful and a machine which combines cutting and percussive action has been tried out at Kalinin Colliery.

At that colliery the waste is held back by three

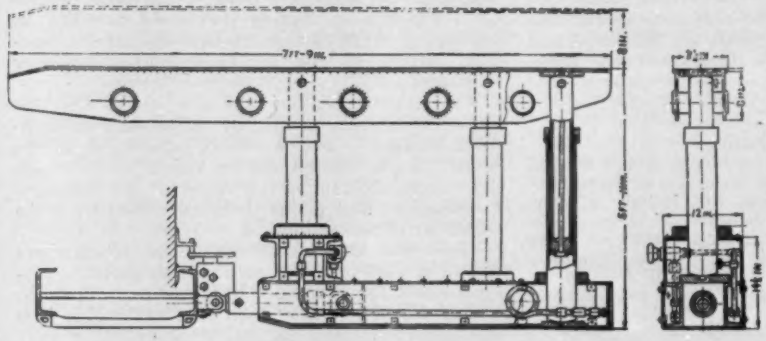

FIG. 1.—PROTOTYPE SELF-ADVANCING SUPPORT OF POLISH DESIGN.

½-in. ropes with a steel net between them, and a cushion of rock which moves forward with the net. The machine has a jib length of 3 ft. 9 in. and the field tests will be continued after the roof supports have been changed from timber to steel elements.—V. P. RUDCHENKO, Ugol, June, 1960.

MECHANIZED TIMBER DRAWING

CAVING is the most popular method in Russian collieries, but in most cases the props are withdrawn by hand or blasted out. The Kiselev works has, after successful field tests, started the quantity production of a prop-withdrawing winch, type LPK-10A, with the following specification:—

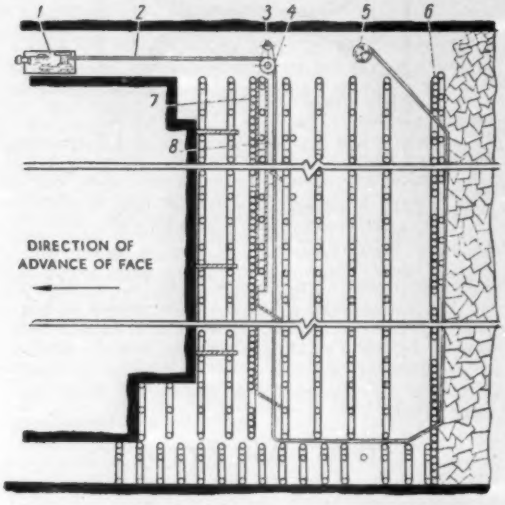

FIG. 3.—FACE LAYOUT FOR WITHDRAWING PROPS.

1.—Winch-type LPK-10A. 2.—Rope. 3.—Support prop. 4.—Deflection pulley. 5.—Anchor prop. 6.—Old timber line. 7.—New timber line. 8.—Inspection passage.

Motor capacity, 27 h.p.; rope speed, 30 ft./min.; drum capacity, 660 ft. of rope; rope dia., ¾ in.

Fig. 3 shows the winch in a 110-yd. face before timber drawing begins. The labour costs are said to be one sixth of the previous method and up to 10 per cent. of the props are recovered and can be used again.—M. G. VEDJAPIN, Ugol, February, 1960.

Stanton Ironworks at Olympia

A selection of the main products of the Stanton Ironworks Company, Limited, at the Public Works Exhibition at Olympia, London, will include a spun-iron pipe with an internal diameter of 42 in., 18 ft. in length. Until recently the largest spun-iron pipe manufactured in Great Britain has been the 27-in. dia. pipe made by the company, but this year a new plant has been installed enabling pipes up to and including 48 in. dia. to be made. The exhibition is from November 14 to 19.

Training of Mining Engineers

APPOINTED by the Midland Institute of Mining Engineers to consider existing schemes for the training of mining engineers, a sub-committee, consisting of Major J. A. Peasegood (chairman), Prof. F. S. Atkinson, Mr. H. F. Banks, Mr. J. E. Longden, and Mr. H. Saul, has issued its report.

Since the training of student apprentices has not been working long enough to assess its merits, the committee confined its observation to the directed practical training scheme of the National Coal Board.

The board's scheme, which has been in operation for over 12 years, is designed to train young men both from inside the industry and from the mining departments of universities and technical colleges in practical work, both underground and on the surface, and in management.

Some of the mining engineers who were consulted considered that ex-trainees, once they were in substantive posts, were often technically sound, but lacked the understanding of how to manage men.

The committee considers there is a limit to the extent to which industrial management can be taught and much depends on the personality of those initially chosen for the scheme. In order to improve this lack of understanding the committee recommends that the directed practical training scheme should be widened to include some period with the industrial relations department of the NCB at Area level.

The committee also recommends that to supplant the fundamental training in basic mining operations, the trainee's programme with Area non-technical departments should be so phased that he follows each departmental process separately and consecutively from the colliery to the Area office. Also, potential trainees should be encouraged to complete their preliminary coal-face training before entering university or technical college, or during vacations. If this were done, a university degree or a diploma in mining should be accepted as exempting MQB candidates from taking the practical papers of the first-class examination for managers.

The recommendation was also made that any paper set in mining law by universities or technical colleges, which would be acceptable to the MQB, should exempt degree and diploma candidates from the mining law paper of the first-class examination, thus giving them exemption from the whole written examination.

There was little evidence that the scheme was failing in what it set out to do. The recommendations which the committee have made are designed to improve the already high standard which it is attaining.

IRON AND STEEL INSTITUTE

IRON AND STEEL ENGINEERS' GROUP

Meeting at Scunthorpe

Visits to large steelworks in the area and the presentation and discussion of four technical papers made the meeting of the Iron and Steel Engineers' Group at Scunthorpe from Monday to Thursday of last week a very instructive one. In addition to delegates from all the steelmaking areas of the UK, there were a few visitors from abroad. The delegates were entertained at dinner by the Lincolnshire Ironmasters' Association, more than 100 guests being present at each of the two dinners held on successive evenings.

The works visits covered the preparation of ore to finished product, and the local plants of the Appleby-Frodingham Steel Company (branch of the United Steel Companies, Limited), John Lysaght's Scunthorpe Works, Limited, and Richard Thomas & Baldwins, Limited, were inspected by the delegates.

Technical sessions were held in the Civic Theatre. An abstract from the first paper is given below. The other contributions to the meeting will be dealt with subsequently. The full papers appear in the October issue of the Journal of the Iron and Steel Institute.

INVESTIGATION OF FAILURES IN A BLOOMING MILL

By F. E. STACEY, A.M.I.Mech.E.
(John Lysaght's Scunthorpe Works, Limited)

THE paper describes investigations into mechanical failures that occurred in a rolling mill and the assessment of mill loading under operational conditions, made with the object of minimizing future breakdowns.

Description of Plant

The main details are as follow:—

TYPE: 42-in. blooming mill.

MANUFACTURER: Davy & United Engineering Company, Limited.

COMMISSIONED: 1950.

DETAILS OF ELECTRICAL DRIVE: English Electric Company, Limited, mill motor, d.c., forced ventilated, reversing machine having an r.m.s. output of 6,650 h.p. at 62 r.p.m. The cut-out torque was 230 m.-tons at 62 r.p.m. Speed control is by variable armature voltage from 0 to 62 r.p.m. and by field weakening from 62 to 150 r.p.m. Minimum reversal time not exceeding 1.5 s. The machine was supplied by a Ward-Leonard-controlled Ilgner set.

In the case of the top drive spindle, the coupling end at the drive side of the mill housing is forged integral with the shaft; this was the initial design. The bottom spindle, however, had been repaired at some previous time with the aid of a cast-steel coupling. The motor drives through a coupling, positioned to a gear unit comprising a pair of double-helical pinions of equal number of teeth. These pinions drive the two spindles, which, in turn, rotate the operational work rolls.

The mill was installed to cater for an envisaged output of 10,500 ingot tons per year. This has greatly increased in the intervening period.

The sizes of material rolled are:—Blooms, 5 in. square up to 9 in. square; slabs, 10¼ in. wide by 4½ in. thick. Qualities of steel rolled are:—Carbons up to 1 per cent.; deep stamping and rimming; silicon and silicon-manganese; free-cutting; lead bearing.

Modification to Coupling Drive

A heavy knock was heard over a long period at different times in the vicinity of the slab coupling drive. This did not appear to be at regular intervals or at identical times of the rolling cycle. Upon inspection, no apparent signs of damage could be located, but it was decided that the noise was caused by the slab within the coupling. As a result of this and the occurrence of breakages to coupling slabs, it was decided to investigate the possibility of fitting a flexible coupling to the main drive, replacing the existing slab type.

Good reports had been heard of the Holset coupling when used in similar drive conditions within the industry. This was investigated and, in consequence, a size 300 unit with a suitable spacer to meet site requirements was fitted during the stop period of August, 1959, an alignment check being carried out at the same time between the motor and gearbox units with satisfactory results.

Outline of the Main Breakages

During the period March, 1955, to September, 1958, a number of breakages of a serious nature occurred on the rolling mill, namely:—(1) The breakage of the knuckle end of a forged-steel top

drive spindle; (2) severe fractures to two slab couplings, with visual signs of cracking in a third, and (3) the bursting of the rim sleeve of the top pinion shaft which formed part of the main mill drive. It will be noticed that all the breakages occurred in an area located between the armature drive shaft and the drive side of the mill housings.

It was felt by the management that confirmation should be obtained that the heavy impact loading and reversal conditions taking place on the mill were not exceeding the design conditions, and also that an alignment check should be made between the armature shaft, gearbox, etc.

Metallurgical reports had been received in respect of the broken spindle and slab couplings, which will be mentioned later, but the loss of such plant as pinions necessitated urgent attention.

Breakages of a magnitude such as the latter can cause indirect damage to items such as gearbox casing, pinion bearings, etc.; even if this should cause no further damage to the plant it can, owing to extended deliveries in obtaining replacements, cause heavy loss in terms of money and production facilities, possibly necessitating the closing down of later processes and the inevitable disruption of those processes leading up to the rolling mill.

Spindle Breakage.—This occurred while rolling a silicon quality steel (0.08—0.13 per cent. C, 1.5—1.65 per cent. Si) of section 12½ in. by 2 in. Visual examination of the fracture showed the break to be crystalline, with an absence of rubbing, indicating a failure under heavy impact loading. A sulphur print was taken by the metallurgists, who reported a uniform distribution of sulphur with a slight segregation at the spindle slot.

A dark area could be seen at the top, where the machined bore existed. It was found that welding had at some previous time been carried out at this point, visual signs being apparent under the machining marks.

It was the metallurgists' opinion that slight cracking had occurred at this point, but that despite the presence of this, which could in normal circumstances initiate fatigue failure under the repeated stresses prevailing, this had not occurred. The report also stated that the mechanical properties and structure of the material appeared suitable for the component and that failure was due to heavy impact loading

Slab Coupling Failure.—This occurred during March, 1957, the coupling having been used in the rolling of over 3,000,000 ingot tons. The fracture occurred diagonally across one of the square holes, through which the coupling bolts fitted into phosphor-bronze blocks, which were located in the coupling.

The metallurgical report stated that fatigue had occurred symmetrically from the four edges about the centre of the corner radii, the initial cracks being very similar in appearance. Microexamination revealed a fairly coarse structure, which is usual in a forging of this size. Sulphur printing and etching produced no abnormalities.

It was suggested that benefit would be derived from future slabs if the quality of the finish at the radii was improved. This is considered to be a matter of great importance. The appearance of the cracks indicated, from previous experience, that they may have been in existence for some time, and the opinion was that the fracture was of a fatigue nature, the physical and chemical composition being in line with that specified by the manufacturers and designers of the plant.

As might be expected, forgings of this size are not obtainable quickly owing to the manufacturing and heat-treatment requirements. In this instance a steel slab was obtained from a local steelworks, rolled from the largest available ingot; it was machined at Lysaght's works and installed to cover the period required in obtaining a forging of the correct steel analysis. During August, 1957, fractures occurred in the replacement slab coupling, after being used for only five months. Failure in such a short period was not altogether unexpected in view of the nature of the replacement unit. The breakage again originated through the radii at the corners, while other cracks radiate from a central screwhole.

The metallurgical findings were that the chemical analysis varied at two points of the material, which was below the specification of the designers of the mill. This was generally known and accepted for the reasons previously stated, *i.e.*, 0.2 to 0.24 per cent. C as compared with 0.3 to 0.35 per cent. C as recommended.

The final comment of the metallurgist was that the slab had been subjected to insufficient hot working to produce suitable grain refinement. It was suggested that future replacements should be produced from larger blooms. Again stress was laid on the need for good-quality machining, though in this instance this was secondary in importance to the unsuitable coarse structure of the material.

Reference to this failure is not intended in any sense as criticism of the quality of the material received from the makers, who supplied very quickly indeed, from the largest sized ingot available, thus enabling the production programme to be maintained. It has been included to emphasize the effect of material which has, owing to its initial dimensions, not been subjected to grain refinement by forging and normalizing, which is usual practice in components of this size and application.

Pinion Failure.—This failure, in September, 1958, was extremely serious, as replacements could, even with extreme pressure being applied, take anything up to 12 months to produce. It was only the generosity of Steel, Peech & Tozer, of Sheffield, in permitting the use of an identical pinion that had been replaced and held as an emergency spare, that enabled production output from the rolling mill to be maintained during the period September, 1958, to August, 1959, when a new pair of pinions became available.

This failure was investigated by representatives of the mill manufacturers. It took the form of horizontal and radial cracking in the sleeve. Visual examination indicated that certain teeth on the broken sleeve bore signs of heavy rubbing, accompanied by severe pitting, whereas other teeth

showed no signs of wear. It was later found that there had been a slight discrepency in the gear-cutting of the pinions, resulting in a tooth being slightly thinner, followed by insufficient bedding of many other teeth. It was obvious that the error of gear-cutting would lead to serious overloads on the adjacent teeth as they passed in and out of mesh, but no definite connection could be made between the lightly loaded teeth and either the crack which initiated failure or the more serious cracks around the rim.

The final findings indicated that the pinion had failed in service owing to fatigue cracks at the root of the teeth. The analysis showed that the combined stress from bending and shrinking had stressed the material into the fatigue range. Metallurgical examination showed normal sulphur segregation and distribution, with segregates well clear of the root of the teech. A micro-section taken from a tensile testpiece showed a fully refined structure of pearlite and ferrite. The pearlite was fairly coarse, but this was not unexpected owing to the retarded cooling at the mid-wall position of the rim.

Guided by the results of the investigation and the time factor in obtaining hollow forgings, it was decided to manufacture the replacements as integral pinions with shaft, in materials of En.9 specification. The original pinions were to be resleeved later with material also to EN.9 specification, the interference between shaft and sleeve being reduced to 0.020 in. from 0.026 in. (*i.e.*, 0.001 in. per in. dia.).

Assessment of Mill Loading

During October, 1958, arrangements were made with the manufacturers of the mill for tests to be carried out by their personnel upon the plant to determine the mill loading conditions, the torque applied to the driving spindles, operating temperature, mill power consumption, and bearing pressure conditions of the motor shaft, and generally to determine if the operating conditions were covered by the design of the mill. To enable the research team to select the periods during which greatest benefit could be gained without necessitating full-time attendance, typical monthly rolling cycles and daily production programmes were made available. This enabled them to select the period of the week in which to be in attendance over the cycle, and further enabled the team to carry out selective tests during the time they were in attendance.

The necessary instruments and recorders were fitted up, the principal measurements being as follow:— Screwdown loadings, from two load-meters (1,500-ton capacity) fitted between mill screws and the top-roll bearing chock; motor speed, from a photo-electric cell; ingot temperature, from a pyrometer on manipulator; end float movement of motor shaft, vertical displacement of shaft, and motor speed, from mill tachometer; bottom spindle torque, top spindle torque, motor bearing pressure —inboard, motor bearing pressure—outboard.

Tests began on June 1, 1959, and were carried out at selected times until September 12. During this time the mill had been closed down for two weeks to facilitate modification of the existing motor shaft necessary for fitting of the new coupling and installation of new pinions and bearings, in addition to the usual routine and annual maintenance programme.

During the period of each test, information was recorded, with the aid of a portable tape recorder, of operational mill draft and chock readings, the time during which the material was in each pass, the time taken in transferring material from one pass to the next, and the total period taken in rolling the complete ingot. After completion of rolling and before the material left the run-out table, the thickness was measured with the aid of calipers to enable a mill-spring curve to be determined. This was later to be used in conjunction with an estimated spread in determining the entry size of the ingots into the respective pass.

General Conclusions

From the results of the tests carried out and calculations made, it was proved that the shear stress in the members of the mill train were not exceeding conditions envisaged and covered in the initial mill design. If the mill is operated under conditions prevailing at the time of the tests, major breakdowns of equipment should not occur, as the plant is working well within its capacity.

The modifications carried out by the fitting of the flexible coupling indicated no appreciable effect upon the performance of the mill, but they dispelled the unexplained noise at the coupling. They should result in the elimination of maintenance troubles in this area, and remove the mechanical shock from the motor, which is absorbed by the rubber elements in the coupling.

The results show that the 15-pass rolling cycle could be adopted for general working during the rolling of 5½-in. by 5½-in., 7-in. by 7-in., and 12½-in. by 2-in. sections, resulting in a possible increase of tonnage output of up to 10 per cent.

The information gained from the tests should prove most useful in future design of rolling mills for it follows the pattern of conditions envisaged and allowed for in design specifications. Above all, the tests provided facilities for gaining information which had previously not been available, and which should in the future prove most beneficial.

On the question of holding spares, the author believes that, in industry as in life, one must take a certain number of risks. In the instance of the pinions, if it had been decided to take a calculated risk, it was unfortunate that it failed, but by good fortune and good will between competitors, it was possible to borrow a second-hand pinion that had been replaced on a life and wear basis. The benefit to be obtained from standardization of major pieces of plant could not be better illustrated. Many people will feel that spares of this nature should be available. The author would agree, since on the price argument, which it must be agreed can be considerable, no firm should place an essential part of its plant in jeopardy, when such compo-

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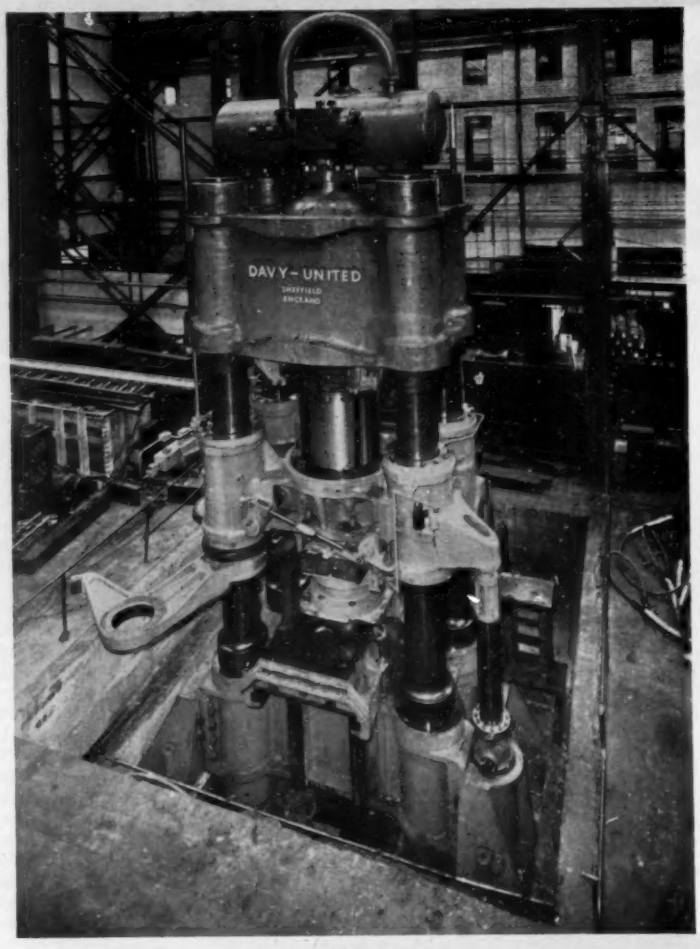
600-ton Hydraulic Wheel Forging Press at Durgapur



PRIMARY productive unit in the wheel and axle plant at the Durgapur steelworks, West Bengal, will be a 600-ton hydraulic wheel forging press, designed to forge cheese-shaped steel ingots into solid railway wheel blanks, ready for rolling and finishing, in five operations taking less than 90 sec.

The wheel and axle plant, which is scheduled to come into service in July, 1961, is being equipped to produce initially 45,000 railway carriage and wagon wheel sets a year (two wheels and one axle per set), with provision for subsequent expansion to 75,000 wheel sets a year. Outputs on these levels are required to meet the Indian Railway Board's carriage and wagon building programme, which is a vital part of India's expanding economy.

The hydraulic wheel forging press has been built by the Davy & United Engineering Company, Limited, a member company of ISCON, the British consortium constructing the steelworks at Durgapur.

IRON AND STEEL INSTITUTE

(Continued from previous page)

nents may take up to 12 months to obtain as replacements

Periodic inspection of gears, etc., should not be ignored just because they are encased within a gearbox. These need the same care and attention as any other part of the plant. As has been Lysaght's practice, an annual inspection and crack detection of teeth and journals, with the aid of magnetic ink or some other method, is considered essential.

Integrated Iron and Steel Works in North Viet Nam

CELEBRATION of the 15th anniversary of the establishment of the Democratic Republic of Viet Nam was marked recently by embarking on the erection of its first integrated iron and steel works, at Thai Nguyen, for which the preparatory work had been in progress for about a year, during which period an oxygen factory and a welding workshop have been built, as well as a hydro-electric plant to supply power.

When ceremonially pouring the concrete for the foundation of the first blast furnace, the Minister of Heavy Industry, Mr. Nguyen Van Tran, said the building of the plant, which is to have an initial annual capacity of 100,000 tons of steel, "is a milestone in the socialist industrialization of Viet Nam." The plant is being built with the technical and financial assistance of China.

INDIA'S THIRD FIVE-YEAR PLAN

Too Much Emphasis on Steel?

REFERRING to India's Third Five-Year Plan, Mr. J. R. D. Tata observed in Jamshedpur that few people would disagree with the proposition that India needed a plant of the size that had been outlined in the draft recently published, but the real question was whether they were in a position to mobilize now the resources a plan of the size proposed would need. Mr. Tata, who was in Jamshedpur for the inauguration of his company's new merchant mill, said they were perhaps laying too much emphasis on steel.

If the intention was that there should be a steady increase in employment opportunities, Mr. Tata said, they had to set up such industries as would produce the goods needed and also provide a maximum number of jobs. User industries utilizing the steel available could produce many more jobs than, say, a million-ton steel plant, which would, at best, employ 8,000 men under Indian conditions.

At the opening of the merchant mill, Sir Jehangir Ghandy, director-in-charge, expressed the hope that whenever the steel target position was reviewed due consideration would be given to the substantial surplus capacity available at the blooming and finishing mills at Jamshedpur. This is the last unit in Tata's 2,000,000 tons of steel programme. Sir Jehangir also referred to the fact that the entire increase in steel production under the Third Plan had been earmarked for the public sector plants. He stressed the need for a fresh approach to the problem of distribution control in the iron and steel industry to bring it into line with the changed circumstances of today. He pointed out that certain categories of products already exceeded the demand.

The mill which was commissioned has an annual capacity of 220,000 tons, which can be increased to 330,000 tons later. The mechanical equipment has been supplied by a West German firm and a Swiss firm has supplied the electrical equipment.

Steel Plant for Madras

The possibility of the proposed iron and steel plant for Madras State going into production before the end of the Third Five-Year Plan period was indicated by Mr. C. Subramaniam, Finance Minister of Madras, in the Legislative Assembly. He said that the Government's intention was to set up two units initially, one using lignite from Salem and the other electricity for production of iron by a process employed in Norway. The future expansion of the plant, he said, would depend on the decision as to which process was more economical. The type of furnace for smelting Salem iron ore would be determined after tests in East Germany using 1,000 tons of Neiveli lignite.

Mr. Subraniam said that all doubts had now been set at rest about the suitability of Salem iron ore and Neiveli lignite for the production of steel. All that now remained to be done was to determine the suitable smelting process. The choice was between the East German process, which used lignite, and the Norwegian method, which used electricity.

Alloy and Special Steel Plant

The detailed project report for the alloy and special steels plant to be established in the public sector in the Third Plan period in India has been submitted to the Ministry of Steel by the consultants, Dastur & Company. A study of the future consumption of alloy and special steels in India made in the report estimates the requirements of such steels at over 200,000 tons of finished steel by 1965. This is four times the initial capacity of the proposed plant in the public sector. The report therefore points out that even after this plant is expanded it is imperative to install new capacity to produce alloy steels. Durgapur has been recommended as the most suitable site for the project.

The consultants are said to have expressed themselves against splitting up the project into two units to be located at two different sites. Offers of collaboration in the project have been received from about half a dozen foreign firms which specialize in manufacturing alloy steels.

The National Metallurgical Laboratory at Jamshedpur has also embarked on a major research programme to study the suitability of Indian raw materials for the production of ferro-alloys. The laboratory will also develop methods for the production of special ferro-alloys like low-carbon ferro-manganese and low-carbon ferro-chrome. A pilot smelting plant with a capacity of 1 ton ferro-manganese per day is being installed at the laboratory.

Steel Re-rolling Mills

With a view to relieving the shortage of iron and steel in India the Government of India has decided to encourage small industrial units which use such re-rolling scrap as may be locally available as raw material. Normally such units will have to obtain licences under the Industries Act and permis-

cion under the Iron and Steel Control Ordinance, but the Government of India has issued a notification relaxing the provisions of the Iron and Steel Control Order in respect of small units so as to allow increased use of locally available scrap to meet the demand in the immediate vicinity for a number of articles of iron and steel in day-to-day use.

India's imports of steel during this year would be of the order of 600,000 tons. Arrangements are being made for the import of steel from the rupee payment agreement countries—the USSR, Czechoslovakia, Poland, Hungary, and Yugoslavia —according to the agreements concluded with them by the Indian Government. Sardar Swaran Singh, Minister for Steel, Government of India, stated in the Lok Sabha, New Delhi, that contracts for the import of 55,500 metric tons of steel from the USSR and 500 tons of steel wire from Czechoslovakia had already been placed. Imports of steel, he added, were also being arranged against the US Development Loan Fund credits as well as barter imports from the UK, the USA, West Germany, Japan, Belgium, Holland, and Australia. He said that imports of steel to India were progressively declining. From 1,173,000 tons in 1958-59, imports came down to 800,000 tons in 1959 and in 1960 they would be about 600,000 tons.

Indigenous production of steel during the current year, the Minister said, would be about 2,500,000 tons—about 800,000 tons more than the production in 1959. The total availability of steel in 1960 would be of the order of 3,100,000 tons—500,000 tons more than in 1959.

The Minister also said that a French and a British team of experts had been invited to advise the Government of India on the efficient management and organization of production of steel at the Rourkela and Durgapur steel plants, respectively, and in particular to suggest the outlines of a system of periodical departmental returns and reports for management information and control purposes. A preliminary report had been submitted by these two teams to the Government and a final report was expected soon. He said a similar team of Russian experts was also examining the problem in the Bhilai steel plant.

Melbourne Iron & Steel Sold

Through its subsidiary, K-M Steel Products Pty., Limited, the Cyclone Company of Australia, Limited, has bought Melbourne Iron & Steel Mills Pty., Limited, a subsidiary of Australian National Industries, Limited. K-M Steel Products will continue steel production in the Melbourne Iron & Steel Mills' plant. Scrap deliveries from the Cyclone subsidiary, M.P. Metals Pty., Limited, will be supplemented by supplies from the metal recovery company J. & C. Johnson Bros., Pty., Limited, which remains an A.N.I. subsidiary, thus ensuring raw materials for future expansion of steel production.

"SELLING CAPITAL GOODS," with particular emphasis on exports, will be the general theme of a conference of the British Institute of Management at Harrogate from November 16 to 18.

Wimet XL35

RESEARCH work carried out to improve the performance of tungsten carbide tips for milling cutters is described in Technical Bulletin STB/2 issued by Wickman, Limited, Coventry. Preliminary research showed that for improved results the rate of wear down the flanks of blades and the frequency of thermal cracks must be reduced or eliminated while still retaining sufficient toughness to resist repeated impacts. It was soon apparent that carbide grain size and structure was an important factor in rate of wear and incidence of thermal cracking.

An exhaustive study of the mechanism of thermal cracking is described and illustrated with photomicrographs. High magnification showed that the paths of the cracks follow a very similar course to those of cracks due to hardness indentation or other mechanical stresses. The cracks pass most frequently through the carbide grain boundaries. Once started, extension is not only lengthwise, but widening is noticeable, particularly at the surface near the cutting edge. The worsening of the cracks is a process in which the carbide grains on either side of the cracks are loosened and carried away bodily in the stream of metal.

The better understanding of thermal cracking gained from this work enabled a tougher, more wear, and thermal shock-resistant grade of carbide tip, namely, Wimet XL35, to be developed. The company will, in future, supply all milling cutters tipped with XL35.

Protective Clothing Against Flame and Heat

RECOMMENDATIONS on the design and use of protective clothing for aircraft crash workers, discussed in Fire Research Special Report No. 3, are based on laboratory tests devised and carried out by the Joint Fire Research Organization to assess the protection afforded against flames and heat by many types of clothing, and are applicable, in addition, to protective clothing for workers in industries involving high-temperature processes. The report analyses conditions of air temperature and radiant heat which firemen and some industrial workers may encounter. It continues by discussing in simple terms the effect of heat on the human body as well as the limits of tolerance and, finally, explains the ways in which suitable protective clothing can give protection against differing conditions of air temperature and radiant heat.

The report is published for the Department of Scientific and Industrial Research and the Fire Offices Committee Joint Fire Research Organization by the Stationery Office, price 3s. (by post 3s. 4d.).

THE BRITISH STANDARDS INSTITUTION has circulated for comment a Draft Standard on measurements of smoke emission from industrial boilers. It covers coal-fired shell boilers with various types of mechanical stoker.

Company News

Aluminium Agreement

ALCAN ENFIELD ALLOYS AND JOHN WADE

FORMED earlier this year as a joint venture between Aluminium, Limited, of Canada, and Enfield Rolling Mills, Limited, Alcan Enfield Alloys, Limited, has concluded an agreement with Metal Closures, Limited, whereby it will lease on a long-term basis the aluminium alloy smelter and zinc alloy production facilities owned by John Dale, Limited, a member of the Metal Closures group.

As a result of the agreement Alcan Enfield Alloys will have the capacity to produce about 30,000 tons of aluminium alloys a year—about 20 per cent. of the total installed capacity in the UK. The company already operates a secondary aluminium smelter at Bradford for the production of foundry alloys from scrap and primary aluminium.

John Dale will continue to own and operate its light alloy foundry and continuous strip casting plant, which will not be affected by the new arrangements.

JAMES GIBBONS, LIMITED, malleable ironfounders, makers of door furniture, etc., of Wolverhampton—The dividend is raised to 20 (18) per cent. Net profit, before tax, rose to £74,330 (£70,538).

SENIOR ECONOMISERS, LIMITED, makers of fuel economisers and accessories, of London, W.C.1—The entire capital of the Phoenix Steel Tube Company, Limited, West Bromwich (Staffs) has been bought.

S. SMITH & SONS (ENGLAND), LIMITED—Final dividend of 15½ per cent. is recommended for the 52 weeks ended July 30, 1960, making 20 per cent. compared with the previous year's effective 17½ per cent.

CORNERCROFT, LIMITED, precision engineers, of Coventry—Final dividend of 10 (12½) per cent. makes 15 (20) per cent. for the year ended June 30, 1960. Group net profit was £40,047 (£54,435) after tax of £41,768 (£42,067).

J. & H. B. JACKSON, LIMITED, metal merchants, of Coventry—Contract has been entered into for the purchase of all the share capital of W. W. Cripps (Engineering), Limited, precision engineers, Coventry, for £52.945 cash.

CROMPTON PARKINSON, LIMITED—Final dividend of 7½ per cent. makes 12½ per cent. for the year ended June 30, 1960, compared with the equivalent of 11½ per cent. Group net profit was £1.276,067 (£1,317,637), after tax of £1.474,550 (£1,438.054).

BOWDEN (HOLDINGS), LIMITED—In announcing a 5 per cent. interim ordinary dividend the directors state that the disparity between the interim and final dividends paid for the year ended March 31 is one of the reasons for the increase in this year's interim.

TUBE INVESTMENTS, LIMITED—Final dividend of 9¼ per cent. is to be paid on a capital increased by a one-for-one rights issue and shares issued against the acquisition of Raleigh Industries, Limited, compared with a forecast of not less than 8¼ per cent. The interim of 8¼ per cent. was paid prior to the rights issue. In 1958-59 the total dividend was 20 per cent. Group net profit was £8,100,735 (£6,458,460), after tax of £9,663,793 (£6,152,202).

GREENWOOD & BATLEY, LIMITED, electrical and mechanical engineers, etc., of Leeds—Details of the reorganization of the capital structure have been sent to holders. All the partly paid shares are to be eliminated and the preference holders' voting and capital rights are to be brought into line with modern practice.

HAILWOOD INDUSTRIES, LIMITED—Dividend is maintained at 15 per cent. for the year ended June 30, 1960, and the directors forecast at least maintenance of that rate for 1960-61 on a capital to be increased by a one-for-two scrip issue. Group net profit increased from £102,985 to £179,871, after tax of £84.778 (£48.764).

HERBERT MORRIS, LIMITED, cranemakers, of Loughborough (Leics)—Group net profit for the year ended July 31, 1960, fell from £433,008 to £117,815, after tax of £279,233 (£409,943). Final dividend of 12½ per cent. makes 16½ per cent. on a capital doubled by a scrip issue. Last year the total distribution was equivalent to 12½ per cent.

G. D. PETERS & COMPANY, LIMITED, makers of railway and road rolling stock equipment, etc., of Slough (Bucks)—There has been an improvement in group trading condition in the current year, state the directors, but profits in 1960 to date do not warrant the payment of an interim dividend. Last year a single 5 per cent. payment was made.

BERALT TIN & WOLFRAM, LIMITED—The chairman states that whatever the future may reveal, the company's profit-earning potential must for the time being be related exclusively to wolfram. With the market range for wolfram fluctuating between 150s. and 200s. the company could continue with a steady production of high-grade wolfram concentrates at a cost which would yield it satisfactory profit.

WILMER LEA FOUNDRIES (HOLDINGS), LIMITED—Acquisition of the trading companies of the parent company, Charles Karen & Son (Holdings), Limited—C.K.S. Group, Limited, and John Batt & Company, Limited—in exchange for cash and an issue of shares, is awaiting the issue of the 1960 accounts of the C.K.S. Group. Full and final details of the scheme will not be sent out until the end of February.

BRISTOL TRACTORS, LIMITED—Conditional agreements have been entered into with the shareholders of Kelbrook Metal Products, Limited, light structural engineers, of Colne (Lancs), and Forecast Foundries, Limited, for the purchase of the capitals for 261,000 ordinary 4s. shares. The directors state that the com-

bined net profits of the company and the two companies to be acquired for the year ending March 31, 1961, will justify at least maintaining the previous total dividend of 11 per cent. on the enlarged capital.

WOLSELEY-HUGHES, LIMITED—An agreement has been reached with Nu-way Heating Plants, Limited, under which the Nu-way capital would be acquired on the basis of two of the company's £1 ordinary shares for every 11 Nu-way 1s. ordinary or "A" ordinary, and one of the company's ordinary shares for every two Nu-way first or second preference shares. Full acceptance would involve the issue of 284,448 shares. Two of the directors of Nu-way, Mr. H. C. Usborne and Mr. H. F. C. Newsom, will be joining the board.

JESSOPE (HOLDINGS), LIMITED—One-for-one rights issue at 1s. 6d. for the 1s. shares to holders of November 15 will raise £146,850. Excess share applications are invited and the directors are taking up at the offer price any shares not applied for. A profit of at least £65,000, before tax, is expected for the year to June, 1961, and, if present trading conditions continue, the figure should be improved on in the following year. A 5 per cent. interim is to be paid on the increased capital and a final of 10 per cent.

SIMMS MOTOR & ELECTRONICS CORPORATION, LIMITED—The interim dividend for 1960 is maintained at 5 per cent. on a capital increased by a one-for-five scrip issue. The 1959 final was 10 per cent. It is proposed to make a one-for-10 scrip issue. The subsidiary, Simms Motor Units, Limited, has acquired Fuel Feed & Injection, Limited, Preston. This company will continue to trade under its present name, offering branch facilities to Simms' customers in that part of Lancashire north of a line from Banks to Shawforth.

COGHLANS, LIMITED, iron and steel founders, etc., of Leeds—The dividend is maintained at 15 per cent. for the year ended March 31, 1960. Group net profit was £41,682, compared with a loss of £12,593, after tax of £26,457 (£128)-. A scrip issue of 100,000 £1 ordinary shares on the basis of two for each ordinary held on November 23 is proposed. The directors state that the £100,000 spent in building and plant extension and modernization during the last three years enabled the company to take advantage of the favourable conditions in 1959-60 and to record its highest-ever profit.

BRITISH ELECTRIC RESISTANCE COMPANY, LIMITED—Final dividend of 12½ per cent. on capital increased by a one-for-five rights issue makes 17½ (15) per cent. for the year ended July 31, 1960. A one-for-four scrip issue is proposed and it is intended to maintain the dividend on the increased capital at 17½ per cent. for the current year. The scrip issue will necessitate increasing the authorized capital and it is proposed to raise this to £300,000. After the capitalization the issued capital will be £225,000. Net profit for the year was £38,779 (£29,273), after tax of £33,400 (£28,200).

SIDNEY FLAVEL & COMPANY, LIMITED, gas appliance manufacturers, ironfounders, etc., of Leamington Spa—Dividend for the year ended July 31, 1960, is halved at 7½ per cent. The consolidated trading profit, after management remuneration but before depreciation and tax, contracted from £311,016 to £189,352. Net profit of £34,670 compares with £84,468, after tax of £35,981 (£101,415). Exports were double the figure achieved in the previous year, says the chairman, Mr. T. C. L. Westbrook, but imposition of hire-purchase controls in April resulted in a decline of turnover in the home market during the last four months of the year.

Associated British Engineering's Plans for Consolidation

FIRST priority of Associated British Engineering, Limited, London, W.C.1, must be to bring the group as a whole to a consistent profit-earning basis at the earliest possible time, states Mr. L. W. Robson, the chairman. If measures such as curtailing the group's activities are required to contribute to this end, the board will not hesitate to take them. While present conditions continue in shipbuilding and in view of the group's large interest in heavy marine engineering, he says, the earnings of consistent profits and the resumption of the ordinary dividend is not immediately in prospect.

The principal problem over the last three years had been the subsidiary, Henry Meadows, Limited, and a comprehensive plan was formulated providing for the rearrangement of its share capital and the sale of equity interest to a private investment company controlled by Mr. Robson, since no other purchaser could be found. The parent company retains the option up to March, 1963, to rebuy 50 per cent. of the ordinary shares at the price it received, £50,000.

Mr. Robson has resigned from the chairmanship to devote himself to the rehabilitation of Henry Meadows, but remains on the board.

Winding-up of Coltness Holdings, Limited

INFORMING members of the procedure to be followed for the winding up of Coltness Holdings, Limited (in members' voluntary liquidation), the joint liquidators state that with the decision in the Whitworth Park Colliery case determined and the consequent legislation, the long and protracted liquidation of the company and its subsidiaries can now be concluded.

Taking all items into account the liquidators report that it will be possible to make a further and final payment to shareholders of 3s. 4d. per share. Total realizations to October 7, 1960, were £7.691,416 and distributions to shareholders have included repayment of the first and second preference shares with interest and eight distributions to the ordinary shareholders totalling to an amount of £8 7s. 8d. per 15s. share.

A general meeting of the company will be held in Glasgow on November 21.

GLYNWED TUBES £1,500,000 ACQUISITION

ARRANGEMENTS are being made by the directors of Glynwed Tubes, Limited, Bilston (Staffs), for the purchase of the entire capital of Normalized Bolts, Limited, Darlaston (Staffs), including its subsidiary, James Wiley & Sons, Limited, for £1,500,000. A rights issue is to be made to cover the cost of the acquisition which is being temporarily financed by the company's bankers.

Full particulars of the profits, assets, and liabilities of the companies will be circulated to holders.

IRON AND STEEL TRADE

DECISION of the Iron and Steel Board to avoid a general increase in steel prices has been welcomed by consumers. In some quarters there were strong hopes, before the announcement of the rise in price of solid fuel, that steel prices would be reviewed in favour of consumers and any increase in steel prices now would have been a blow of double strength. The buoyancy of the industry generally continues and is likely to be maintained for several months ahead.

Pig-iron

Overall demand for pig-iron from the engineering and speciality foundries remains at a substantial level and in all grades of iron no difficulty is experienced in obtaining the required supplies. Low phosphorus irons have the greater call, but good quantities of hematite and some refined irons are being cleared.

There is a much wider margin between demand and supply for the high phosphorus foundry pig-iron, and oversea buyers can obtain ready shipment for these grades.

Ferro-alloys

The demand for ferro-tungsten has reverted to a quiet level, but ferro-vanadium is active and there is a fair request for ferro-molybdenum. Interest in ferro-silicon is maintained, but silicon metal is only slightly supported. Both the high and low carbon grades of ferro-chrome are in active demand.

Reasonable attention is given to ferro-titanium, while ferro-niobium is well supported. There is a fair call on chromium metal.

Semi-finished Steel

Although the re-rollers continue busy there is some spare capacity available, largely because of the lack of suitable labour. Good demand is maintained for small bars and light sections, while all output of reinforcing bars is taken up.

Most of the mills are well provided with steel semis in the mild steel grades, but difficulty in securing prompt delivery of the carbon and special quality steels is fairly widespread.

Finished Steel

Extended delivery dates and apologies for inability to accommodate customers do not lessen pressure for supplies, particularly for all types of plate. Rolling dates for the thinner grades are still being extended. In spite of the fact that supplies of mild steel billets are more than adequate, re-rollers are still heavily in arrears in their commitments for small angles, flats, rounds, etc.

The position has eased for cold reduced sheets, but makers are fully booked for some months ahead. There is still no improvement in the meagre demand for colliery needs.

SOME 200 members of the Institute of British Foundrymen visited Sheffield last Friday for the annual "Visiting Day." Small groups visited the works of Newton, Chambers & Company, Limited, the Brightside Foundry & Engineering Company, Limited, Hadfields, Limited, the English Steel Corporation, Limited, Sheepbridge Engineering, Limited, the Staveley Iron & Chemical Company, Limited, the Osborn Foundry & Engineering Company, Limited, and the laboratories of the British Steel Castings Research Association.

Ore Chartering

CHARTERING from the Mediterranean is still very restricted and there is no evidence of any sustained demand for large carriers, but the market for handy size tonnage is steadier. Poti Manganese to Boulogne paid 31s. f.i.o. and trimmed for 7,000 tons, October, and ore from La Goulette to Port Talbot for prompt loading recently fixed at 36s. 6d. for about 6,600 tons, but there does not appear to be any further inquiry for UK discharge. Huelva/Middlesbrough reports 8,000 tons pyrites residues for October at 24s. with some interest maintained as also for continental discharge. Further tonnage has been taken from Vitoria to Poland for October/November and December, two vessels both about 11,000 tons at 48s. 3d., and Rio/Antwerp-Hamburg Range reports 42s. 6d. for 9,500 tons second half October. Indian ore paid 45s. f.i.o. and trimmed for 9,000 tons, November 1/20 from Marmagoa to Calais, and from South Africa, Lourenço Marques/Baltimore fixed at $7 for 11,500 tons, November 5/20. Ilmenite paid 50s. f.i.o. and trimmed for a 10,000-tonner, Durban/Spezia, January/February loading.

Some small activity is reported with pyrites from Morphou Bay, 9,500 tons for November being taken for Hamburg including Harburg at 27s. 6d., 5,400 tons to Ghent for November/December at 28s. November tonnage to Rotterdam reports 24s. 6d., and November/December from Vassiliko Bay, also to Rotterdam, at 24s. 9d. Huelva/Rouen paid 31s. 6d. for 4,700 tons, October.

Recent phosphate fixtures include 3,000 tons from Casablanca to Hull for October 12/20 at 42s. and 4,000 tons to Garston at 42s. 6d. also October. There is also some further interest to China and a 12,000-tonner for second half October has been fixed from Casablanca to Not North of Shanghai at 55s. with the option of Safi loading at 1s. extra, f.i.o. and trimmed basis.

AEI EXPORT MANAGEMENT CHANGES

EXPORT company of Associated Electrical Industries, Limited — AEI Export, Limited — which was formed in 1959, is to have a single managing director instead of three joint managing directors. Mr. F. R. Mason has taken over the position.

Mr. E. V. Small, who was one of the three joint managing directors, has retired from executive work with the company and is appointed consultant. Mr. H. West, managing director of Associated Electrical Industries (Manchester), Limited, has joined the board and Mr. B. A. Hensler, previously one of the joint managing directors, is to continue as a director.

Personal

Award for Durham NCB Scientists

DR. D. A. HALL

TWO Durham Divisional Coal Board scientists, Dr. D. A. HALL and Mr. J. GORDON, have been awarded the silver gilt medal given annually by the Coke Oven Managers' Association for the best paper presented to the association.

The subject of their paper was "Improvement in Metallurgical Coke Quality." Dr. Hall, who lives at Monkseaton, has been Durham Divisional chief scientist since 1951, prior to which he was with the West Midlands Divisional Coal Board. Mr. Gordon, whose home is at Chester-le-Street, is deputy divisional chief scientist.

Mr. VINCENT LAYDEN, of Arigna Collieries, Limited, has been elected president of the Irish Mining and Quarrying Society. He succeeds Prof. M. A. Hogan, of University College, Dublin.

Mr. WALTER SOMERS, managing director of Walter Somers, Limited, makers of heavy steel forgings, etc., Halesowen, has left for a business tour of Australia. He will be away for about six weeks.

The Minister of Power has appointed Mr. J. GOATCHER, manager of the coal department of the Co-operative Wholesale Society, Limited, London, to be a member of the Industrial Coal Consumers' Council.

Chairman and managing director of Parsons Chain Company, Limited, Stourport-on-Severn (Worcs), Capt. J. G. HOPCRAFT, is to retire at the end of the year. He is also chairman and managing director of British Wire Products, Limited.

Mr. W. M. WALLACE, managing director of the Automatic Coal Cleaning Company, Limited, Carlisle, has left on a four weeks' business visit to Australia. He will study coal-cleaning problems in New South Wales and Queensland.

After 52 years with Ashmore, Benson, Pease & Company, Limited, makers of blast-furnace and gas-works plant, etc., of Stockton-on-Tees, Mr. HARRY BULMER, cashier, has retired. He started with the company as an office boy.

Mr. S. H. DUNLOP, production manager at the Central Marine Engine Works of William Gray & Company, Limited, shipbuilders and repairers, of West Hartlepool, has been installed as president of the Cleveland Scientific and Technical Institution.

A cheque has been presented to Mr. J. A. B. HART, chief electrical and mechanical inspector at the Spennymoor (Co. Durham) works of Associated Electrical Industries, Limited, to mark his completion of 45 years' service with the company and its predecessors.

The Minister of Labour has appointed Mr. T. N. KENNEDY, John Turton & Company, Limited, Sheffield, to be a member of the Joint Advisory Committee for the Cutlery and Silverware Trades in Sheffield and district, in succession to Mr. E. W. E. Cook, who has resigned.

Following the announcement that Dowty Seals, Limited, Ashchurch (Glos), was setting up a factory in Malta, to assist with that island's economy, Mr. F. BASTOW, managing director, and Mr. S. HINCHCLIFF, production director, have been visiting the island to conclude initial arrangements.

After trade talks in Moscow, Mr. HUGH D. BINYON, group product sales director, and Mr. D. J. HENDRY, export manager international division, of the Solartron Electronic Group, Limited, Farnborough (Hants), left last week for an extensive tour of the Far East. They will return to the UK on December 1.

Mr. EDWIN J. PARKER, manager of the London branch of W. J. Furse & Company, Limited, lift builders, engineers, etc., of Nottingham, retires at the end of the month after 42 years' service with the firm. He will continue to serve the firm in an advisory capacity. His son, Mr. D. E. PARKER, succeeds him as London branch manager.

Sir JOHN WRIGHTSON, vice-chairman and managing director of Head Wrightson & Company, Limited, has been nominated as president of the Tees-side and South-west branch of the Incorporated Sales Managers' Association. He will succeed Mr. T. H. Summerson, chairman and joint managing director of Thomas Summerson & Sons, Limited, group.

The Mayor of the City of Guatemala, Sr. LUIS F. GALICH, paid a visit to the Stanton Ironworks Company, Limited, near Nottingham, on Thursday of last week, when he saw the manufacture of large diameter spun iron pipes. Mr. L. Rawlins, general commercial manager, and Mr. J. D. Hickman, general manager, export sales, acted as hosts to the Mayor and his colleagues.

"Insight," a series of 11 programmes on BBC Television which began on Tuesday, is being presented by Dr. J. BRONOWSKI, the National Coal Board's director-general of process development. The series, described as "an exploration into our new understanding of nature," is continued next Tuesday and on the first two Tuesdays in the month until April 4.

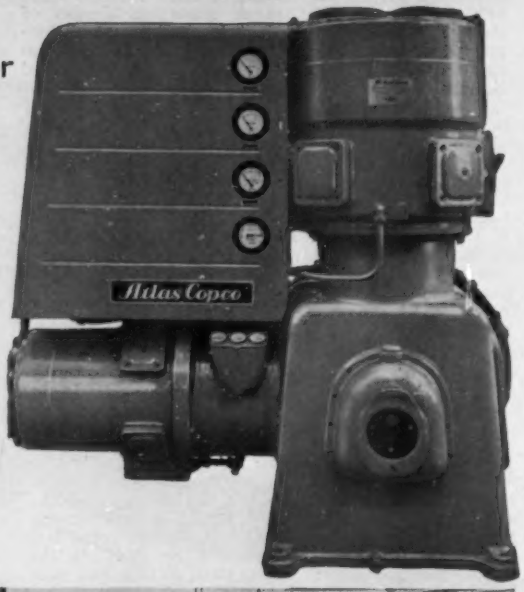
AFTER 51 years with Steel, Peech & Tozer, branch of the United Steel Company, Limited, Mr. JAMES EDWARD MICKLETHWAIT, staff foreman in the tyre mill, has retired. He is a former chairman of the Ickles No. 2 branch of the British Iron, Steel, and Kindred Trades' Association and has been chairman and secretary of the No. 5 branch. He holds two medals from the TUC for his trade union work.

Mr. A. I. BAKER, chairman of the Peterborough engineering firm of Baker Perkins, Limited, manufacturing engineers, iron, steel, and brass founders, of Peterborough, has left for Israel. He will discuss with Government officials an agreement between the Baker Perkins group and the Israel Government plans for exploiting, developing, and marketing tetrabromoethane obtained from the Dead Sea and used in minerals separation.

Mr. LANCE MOORE of the Castrol, Limited, group, has left for a nine-months' tour of Australia. He will assist the company's Australian organization in the development of its industrial oils business, with particular reference to the machine-tool trades. For the greater part of 40 years Mr. Moore has held senior technical appointments with W. B. Dick & Company,

Here's Air Power at ROCK BOTTOM cost

ER6 Heavy-Duty Compressor for reliable 3-shift operation



Atlas Copco's ER6 compressor delivers air at the lowest possible cost. Designed to incorporate *every* economy factor, it combines the lowest possible running costs with low installation costs and a space saving design.

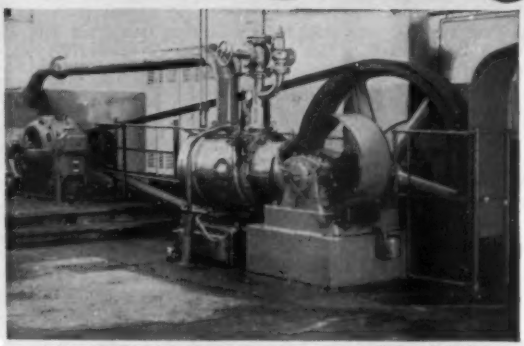
The ER6 delivers 1,075 cfm at 100 psi (30.4m³/min at 7 kg/cm²) for a power consumption that is absolutely rock bottom. Thanks to a new type of intercooler, water consumption is only 440 imperial gallons (2,000 litres) per hour—a *quarter* the consumption of most similar machines. The ER6 is compact. Occupying only half the space usually required for machines of its capacity, it saves expensive factory space. In addition, installation costs are lower as new, cheaper installation methods are employed.

RANGE OF STATIONARIES

From 2.5 to 20,000 cfm, there is an Atlas Copco stationary compressor to suit every requirement. Whatever the design factor—compactness, low installation cost, low operating cost, or a combination of all three—Atlas Copco stationaries are high-performance machines you can rely on.

Sales and Service in Ninety Countries

Represented in ninety countries, Atlas Copco is the world's largest organisation specialising solely in compressed air equipment. Products include stationary and portable compressors, rock drills, loaders, hoists, air tools and paint-spraying equipment. Wherever you are, the international Atlas Copco group offers expert advice and provides a complete after-sales service.



Built to last. This Atlas Copco compressor was installed at the Bofors engineering works (Sweden) in 1907. It is still in operation.

WRITE FOR THE LEAFLET Leaflet E1127 gives full details of the ER6 compressor. Write for a copy to your local Atlas Copco company or agent or to the address at the foot of this advertisement.

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S.168

Limited, and with Fletcher Mills, Limited, both members of the Castrol group.

Mr. E. W. PARRY, engineering manager and a director of Cammell Laird & Company (Shipbuilders & Engineers), Limited, Birkenhead, was re-elected chairman of the National Association of Marine Engine-builders at the annual meeting in Edinburgh on Wednesday. Mr. D. G. OGILVIE, managing director of Hawthorn, Leslie (Engineers), Limited, Newcastle-upon-Tyne, and a director of Hawthorn, Leslie (Shipbuilders), Limited, Hebburn-on-Tyne, was re-elected vice-chairman.

Mr. NORMAN FISHER, principal of the National Coal Board's Staff College, and well-known as the chairman of the BBC's Brains Trust, visited the East Fife Area of the Scottish Division last week. He was the guest speaker at the monthly meeting of the East Fife Mining Club and addressed members on the subject of "Leadership," for which he was thanked by Mr. T. D. M. Scrimgeour, Area general manager. Prior to the club meeting, Mr. Fisher paid an underground visit to the new sinking at Seafield Colliery, where he was conducted round by Mr. A. M. Johnston, deputy Area production manager (planning), and Mr. A. Ludkin, colliery manager.

Durham's Safety Scheme Gives Results

PRACTICAL action at the pit, education and training, and publicity were the three main facets of the Durham Divisional Coal Board's safety campaign, said Dr. W. Reid, the divisional chairman, reviewing the campaign on Saturday. While no one could feel content, progress was being made, he said. In the 22 months of 1959 and 1960 to date, 40 men had been killed, compared with 85 in 1957 and 1958.

The meeting was attended by representatives of the Coal Board, the NUM, NACM, and of the colliery consultative committees from Nos. 1, 2, and 6 Areas. "The progress we have made," Dr. Reid told them, "would not have been possible but for Mr. Sam Watson and his executive, the Durham County Federation Board, and union leaders at colliery level throughout the coalfield."

In the first nine months of the year the overall accident rate per 100,000 shifts in the coalfield was 134.31, compared with 144.83 in the corresponding period of 1959. The awarding of quarterly prizes for safety had done much to draw attention to the scheme. This quarter's prize is a new car.

Speaking at a concert at Blackhall, last week, Mr. K. Wilson, deputy production manager (planning) of No. 3 (South-east Durham) Area, said there were 150 fewer accidents in the Area in the last quarter, compared with the same period, 1959.

ANOTHER ELECTION FOR LANCS NUM SECRETARY

FRESH ballot for the general secretaryship of the Lancashire Area of the National Union of Mineworkers is to be held. Although it has been decided that there were no irregularities in the September ballot as a result of which Mr. J. Gormley was elected, he resigned because of "the dirty unwarranted attacks on the good character of the officials and members of the NUM in Lancashire."

Mr. Gormley defeated Mr. J. Hammond by 5,000 votes and both men will stand again.

Scientific Workers Urge National Fuel Policy

ECONOMIC planning organization for the fuel and power industries—coal, gas, and electricity—is essential if coal is not to be superseded by oil. This is the view of the Association of Scientific Workers which has set up a committee to formulate a fuel and power policy. This committee's recommendations were outlined on Sunday by its chairman, Mr. W. J. S. Pringle, at a meeting in Barnsley, called to publicize the association's policy and to gain the support of trade unions and the general public.

Unless a controlling body is established, the committee sees coal being superseded by oil with the irretrievable loss of a great part of the country's coal-mining capacity and an increasing dependence on imported oil. The whole pattern of fuel consumption throughout Europe was "in a state of flux," which made the need for a definite British fuel policy the more urgent, since the future was becoming even more difficult to forecast.

It was also recommended that there should be an investigation into coal distribution with a view to increasing efficiency and increased expenditure on scientific research.

The meeting was attended by representatives of the Yorkshire Area of the NUM, the National Association of Colliery Overmen, Deputies and Shotfirers, and the North-eastern Area of the Association of Scientific Workers.

Pontifex Dust and Fume Control and Recovery Equipment

SOLE licence throughout the world for the design, manufacture, and sales of Pontifex dust and fume control and recovery equipment has been granted to Fredrk. Jukes, Limited, Lower Morden, Surrey. Mr. C. A. Bainbridge and Mr. F. C. Caplin, who invented and developed the equipment for H. Pontifex & Sons, Limited, Birmingham, have been appointed to the board of Fredrk. Jukes and are in full control of future developments.

The equipment, which has been manufactured at Morden from the outset on behalf of the licensors and under the direction of Mr. Bainbridge and Mr. Caplin, includes the fully automatic filter plant and the wet washer (specially devised for the treatment of vapours and fumes unsuitable for fabric filtration), both unit constructed.

More Pay, Less Work

WAGE increases totalling nearly £150,000,000 a year were received by more than 8,000,000 workers during the first nine months of 1960, the Ministry of Labour Gazette reports. This was double the number, and almost three times the sum, for the same period last year, when 4,236,000 employees had net increases in pay rates worth £56,000,000 a year.

The numbers granted a shorter working week showed an even larger rise. So far this year, 5,689,000 have had their normal hours reduced by a total of 10,339,200 a week. During the corresponding 1959 period the figures were 350,900 workers and 460,500 hours.

Here is the NEW LOOK

125 c.f.m.

"POWER VANE"

ROTARY COMPRESSOR

from **Consolidated Pneumatic**

A new design makes its debut . . . the dynamic 'new-look' Power Vane 125 Compressor. The canopy design has been re-styled and streamlined and finished in two-tone green colour scheme. The unit is now considerably lighter in weight; fitted with fold-away tow-bar wheel and lifting handles for improved manoeuvrability. The new design means easier access to tool-box and engine for day-to-day maintenance; easier canopy removal for major overhauls.

The 'new-look' model retains the advantages of modern rotary design—its two-stage in-line oil-cooled unit eliminating pistons, crankshaft, clutch and valves. Electric starting is standard; regulation is fully automatic.

Robust and reliable as ever, the 'new look' Power Vane 125 Rotary Compressor now adds easier accessibility, easier maintenance, easier handling to its fine reputation for toughness.

POWER VANE

A brochure giving full details is available on request.

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CP/243

Coalfield News

Record Output by Linby Colliery

WHAT is believed by the National Coal Board to be a record output for a British deep mine was recorded at Linby Colliery (Notts) last week. The mine produced 21,235 tons of coal, which means that the men produced about 75 cwt. per manshift.

This rate of production is three times the national average.

VERDICT OF Accidental Death was recorded on Mr. Austin Rufus Wheeler (47), a miner who was suffocated in a fall of rock at Llanbradach Colliery (Glam).

HIGH-PRESSURE fire pumps were used to maintain the daily supply of 7,000,000 gal. of water to Merthyr Vale Colliery (Glam), last week when a dam in the River Taft was swept away by floods.

SIX RETIRED MINERS, each with 50 years' service, were entertained by Bowhill Colliery Social and Welfare Club, Fife, recently. Mr. G. Henshilwood, manager of Bowhill Colliery, presented NCB service certificates and gifts from the club.

OVERALL productivity in the Durham Division of the National Coal Board has increased by 0.62 cwt. per manshift in the past year. At the face productivity has reached an average of 64.49 cwt. per manshift compared with 62.54 cwt. last year.

DEVELOPMENT AT Valleyfield Colliery, Fife, will tap underground sources of methane. The gas will be incorporated by the Scottish Gas Board into its domestic supply. The extractor plant, the first of its kind in the east of Scotland, is to be highly automated.

AFTER being stationed off the mouth of the River Tyne for 12 months the NCB's sea-boring tower is to be moved to a new position further south, near Sunderland. The tower will investigate the extent of undersea seams workable from Ryhope Colliery, Sunderland.

THE ONE-DAY STRIKE proposed to take place on Monday was called off on Thursday of last week when representatives of NUM lodges in the South Wales coalfield decided that strike action should be deferred pending the result of the new wage negotiations at national level.

FRUIT MACHINES may be installed in miners' welfare institutes throughout Nottinghamshire in the new year. Mr. Albert Martin, joint secretary of the Nottingham district committee of the Coal Industry Social Welfare Organization, said: "If you don't instal them, then the man around the corner will and your youth will use them to the clubs' disadvantage."

A NATIONAL COAL BOARD spokesman has stated that coal reserves under Stanley Colliery, near Ilkeston (Derbyshire) are virtually unworkable. In 1958 a meeting of technical experts and representatives of the NUM agreed that the reserves would not be exploited. Recently some NUM representatives have criticized the NCB's decision not to mine coal in the Low Main Seam.

EXPLOSION at the disused Bonds Main Colliery (Derbyshire) hurled Mr. William Sellars (60), 150 ft. on Tuesday. The colliery is now used solely as a pumping station and an East Midlands Divisional Coal Board spokesman said that the explosion appeared to have occurred at the surface. It demolished the air lock and two other old buildings due for demolition.

Trade with Mexico

PLANS to hold two specialized all-British trade fairs in Mexico City next year are announced by the Federation of British Industries and the Dollar Exports Council, which are sponsoring the fairs.

The first fair, to be open from September 29 to October 15, 1961, will be called "British Equipment for Mexican Industry." It will cover not only raw and semi-finished materials and all kinds of components, but also tools; production machinery; mechanical handling and factory transportation; weighing and packaging; measuring and other instruments; and a variety of other producers' goods. It will also cover materials and plant used by Mexican building and contracting industries.

The second fair, running from November 3 to 19, covers British equipment for Mexican development, concentrating especially upon agriculture, dairy and food processing, and also plant and equipment of the many types associated with community developments.

Cost of exhibiting will be 80s. per sq. ft. inside the exhibition building and 30s. per sq. ft. for outside space suitable for heavy machinery.

The World Bank has just made a loan equivalent to $25,000,000 to assist in the development of Mexico's highway network. Including this loan, the bank has made nine loans totalling $211,300,000 in Mexico. The earlier loans were for the expansion of electric power facilities, railway rehabilitation, and industry.

Oversea Expansion for Lake & Elliot

REPLYING to a shareholder at the annual meeting, who asked whether the board proposed to use "the large amount of liquid capital," Mr. C. J. Lake, chairman of Lake & Elliot, Limited, steel and iron founders, etc., of Braintree (Essex), said that the directors have considered the effects of the European Common Market and the influence nationalism may have on the company's business and to that end negotiations were in progress for the manufacture of the company's products abroad.

He added that if the board's plans and negotiations materialized they would absorb quite a considerable portion of the available resources. However, the board felt that the shareholders would rather that the cash surplus was used in profitable enterprise than distributed back perhaps as a cash bonus.

Anglo-German Tube Plant Agreement

AGREEMENT has been concluded between Mannesmann-Meer, AG, Germany, and the Loewy Engineering Company, Limited, Bournemouth, for the supply and installation of plant for the production of seamless tubes of carbon steel and low alloy steels throughout the world. The agreement provides for technical co-operation, and economic exploitation of the manufacturing facilities which are at the disposal of the two companies, and includes the services of Mannesmann-Meer Inc., of Youngstown, Ohio, which for several years has been dealing with Mannesmann-Meer equipment in the US.

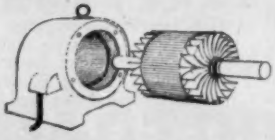
Electrical Aids in Industry *Data Sheet* **No. 14**

Electric Motors & Controls-1

Most manufacturers today employ electric power through individual drives, which permit the right type of motor to be used for each machine. The range of motors available is very large and the factory executive could well be guided in his choice by the expert views of the motor manufacturer, the installing engineer or his Electricity Board's engineer. The characteristics of the main types of motor are summarised below.

Squirrel-cage Motors

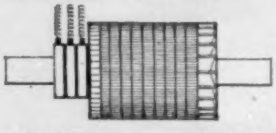
These are the most straightforward and simple in design, and are therefore relatively cheap and robust in character. They should be considered for general duties and in conjunction with variable-speed gears or couplings for applications requiring variable speeds, e.g., for crane drives.



The squirrel-cage motor is very suitable for individual drive of each motion of single-purpose machine tools where the motor horsepower can be precisely specified. It is suitable for driving pumps, fans, lifting hoists and woodworking machines. Textile machinery represents another field of use.

Slip-ring Motors

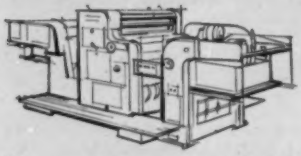
The chief advantage of the slip-ring motor is a very low starting current for a given torque, e.g., full-load torque at starting with a current about 10% above full-load current. This makes it suitable for applications requiring a prolonged



starting period with a load of high inertia. It also permits of speed variation below synchronous speed, though with some loss of efficiency. Typical applications include fans, pumps, heavy lathes, grinders, boring mills, calendering machines and mine hoists.

Three-phase A.C. Commutator Motors

The main characteristic of this type is variable-speed with uniform and gradual acceleration and good efficiency over the speed range. Paper manufacture provides excellent examples of its use, e.g., in reeling, cutting and drying.



A.C. commutator motors are recommended for mechanised bakeries and for cranes and hoists where very slow speeds are frequently needed.

Synchronous Motors

These are constant-speed motors. One particular advantage is that they can be operated at unity or even at leading power factor to correct a system suffering from lagging power factor, and perhaps so qualify for a reduction in the electricity bill. Pump and compressor drives are typical uses to which they can be put.

Single-phase A.C. Motors

In general, single-phase motors are used in light industries for drives not requiring more than about five horsepower or where a three-phase supply is not available. While their use is mainly limited to work of a light nature, they do fill a need in such duties as sewing-machine drives, portable hand tools and window-opening gear.

Direct Current Motors

For an unfettered performance where wide ranges of speed variation are all-important, the D.C. motor is unrivalled. This means the installation of an A.C.-D.C. motor-generator set or rectifier to give the necessary supply, but the increased cost may well be worth while. When variable voltage is applied to the armature, a wider speed range is obtainable than with any other type of motor. Typical applications of the D.C. motor are: cranes, haulage and tippler equipment and high-speed printing.

For further information, get in touch with your Electricity Board or write direct to the Electrical Development Association, 2 Savoy Hill, London, W.C.2. TEMple Bar 9434.

They can offer you excellent reference books on electricity and productivity (8/6, or 9/- post free) — "Electric Motors and Controls" is an example. E.D.A. also have available on free loan within the United Kingdom a series of films on the industrial uses of electricity. Ask for a catalogue.

7914-4

NEWS IN BRIEF

CASH AWARDS were made to 60 apprentices of Brown Bayley Steels, Limited, Sheffield, on Thursday of last week at a ceremony to mark their technical examination successes.

STEEL PRODUCTION in Italy in the first nine months of this year was 26.8 per cent. above the level of the corresponding 1959 period, this year's tonnage of 6,106,419 comparing with 4,815,500.

THE HUNGARIAN trading corporation Komplex announces that it has installed three rolling mills in Communist China. These include a 200,000-metric tons unit at Cheng Tu and plants at Tai Yuan and Honan.

TREBLE CHANCE came up for 16 fitters at the Hebburn factory of A. Reyrolle & Company, Limited, on Monday. Each man has won about £1,400 for his 2s. 7d. stake.

A CARGO OF 14,550 tons of iron ore has been shipped from the Dominican Republic to Rotterdam. The ore came from the Hatillo and Maimon mines and is part of an 800,000-ton contract the Republic has with a German firm.

A BRANCH of the Cementation Company, Limited, group, has been established in Australia. Operating initially from Melbourne, it will concentrate on all aspects of foundation engineering and will be under the management of Mr. J. Carlisle.

THREE handler trucks, capable of handling steel coils weighing up to 45,000 tons, were handed over to the Ebbw Vale works of Richard Thomas & Baldwins, Limited, by their maker, Yale & Towne Manufacturing Company, Philadelphia, last week.

BIRMINGHAM UNIVERSITY has accepted the offer by Joseph Lucas, Limited, to second to the university each year an American professor, nominated by the university to hold a Joseph Lucas Visiting Professorship in the department of engineering production.

INCREASE IN ITS CAPITAL to NF 97,350,000 by the issue at par of 88,500 new shares at NF 100 each is to be made by Forges et Ateliers du Creusot, the steel company in the Schneider group. The issue will be at the rate of one new share for every 10 old.

INSTALLATION of a display and demonstration room at the London office, Star House, 16, Great James Street, W.C.1, of Walker, Crosweller & Company, Limited, makers of indicating and recording instruments, thermostatic mixing valves, etc., of Cheltenham, is now complete.

CHARTERED AIRCRAFT flew control panels worth £12,500 and weighing 10 tons, from the Tees-side works of Head, Wrightson & Company, Limited, to the Durgapur steelworks in India at the weekend. The panels were needed to complete the second blast-furnace at the plant.

TWO railway cranes, worth $500,000, have been built by Cowan Sheldon & Company, Limited, Carlisle, for the Quebec Cartier Mining Company, Limited, Canada. One of the cranes has a lifting capacity of 250 tons and the other of 150 tons and they are claimed to be among the most powerful in the world.

AS PART of the golden jubilee celebrations of the Association of Mining Electrical and Mechanical Engineers, the Safety in Mines Research Establishment is staging an exhibition and film show at the Welsh College of Advanced Technology, Cardiff. The display is open until tomorrow (Saturday).

URGENT ORDER to supply emergency electric generating equipment to the Union Castle liner Capetown Castle is being met by George Cohen, Sons & Company, Limited, a member of the 600 Group of Companies. The liner was disabled off Las Palmas by an explosion in the engine room a fortnight ago.

STATOR, weighing 155 tons, part of a turbine generator built by Associated Electrical Industries, Limited, for the Burrard Sound power station of the British Columbia Electric Company, Limited, left Manchester on Tuesday. AEI is to supply six 150-mW generators to the company under a $30,000,000-contract.

TWO old grain warehouses at Sunderland South Docks are to be leased to the Cement Marketing Company, Limited, the selling organization of Associated Portland Cement Manufacturers, Limited. They will be converted into a new type of depot for handling the company's Blue Circle and Ferrocrete cements in bulk.

RECENT extensions of the Manchester factory of the Glacier Metal Company, Limited, and the provision of a number of special purpose heavy machines enables the company to undertake the repair and manufacture of an increased range and volume of large whitemetal plain bearings. Bearings from 1 in. to 5 ft. bore diameter can now be manufactured.

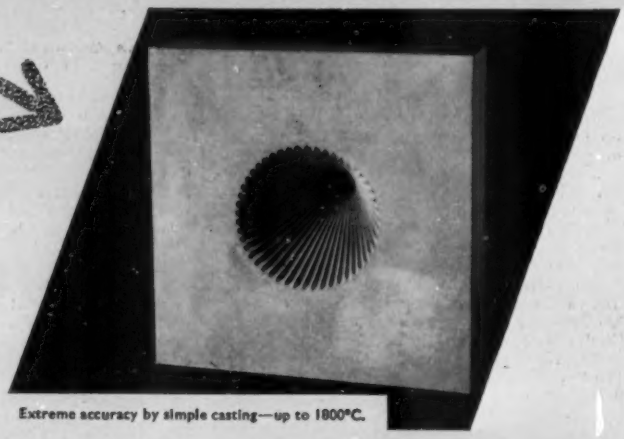
CHAIRMAN of the South African State-owned Iscor steel company, Dr. F. Meyer, has announced that it intends to spend between £270,000,000 and £280,000,000 during the next 12 years to double its present steel production of 2,350,000 ingot tons annually. To meet this target at least one new steel mill would have to be built in the Union.

TWO COMPANIES in the Joseph Lucas, Limited, group have changed their names. Joseph Lucas (Hydraulic & Combustion Equipment), Limited, is now Lucas Industrial Equipment, Limited, and Joseph Lucas (Gas Turbine Equipment), Limited, has now become Lucas Gas Turbine Equipment, Limited. No alteration in the constitution of either company is involved.

PLANT for the manufacture of sulphamic acid is to be built by Marchon Products, Limited, a member of the Albright & Wilson, Limited, group, near its Whitehaven (Cumberland) factory. The plant will provide enough acid, which is used as a de-scaler for cleaning metals in many industrial processes, to meet all the requirements of the UK as well as a substantial surplus for export.

A CENTRAL EXPORT ORGANIZATION, Massey-Ferguson (Export), Limited, has been set up by Massey-Ferguson to co-ordinate and stimulate the group's expanding export activities throughout the world. The staff of the company will be based at Coventry. Mr. W. W. Mawhinney, who is also a vice-president of the parent company, will be managing director, with Mr. W. Reed-Lewis, marketing director, and Mr. P. A. V. Spencer, sales director.

THE DUTCH GOVERNMENT announces that it has dropped its holding in Holland's main steel concern, Koninklijke Nederlandsche Hoogovens en Staalfabrieken, NV, of Ijmuiden, from 30.6 per cent. to 27 per cent. of the share capital . This is the result of a Government decision not to make full use of a priority right in the purchasing of new shares in a recent Hoogovens capital increase on the ground that no more public money could be spent on the financing of the steel concern.



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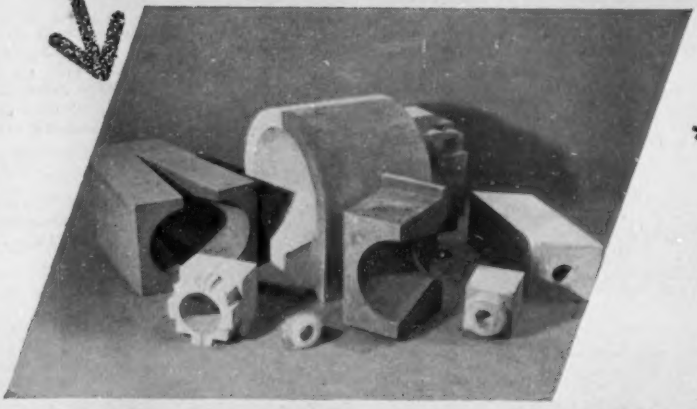

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AP77

CURRENT PRICES OF IRON AND STEEL

(Delivered, unless otherwise stated)
November 3, 1960

PIG-IRON

Foundry and Forge Iron.—No. 3 iron, Class 2, Middlesbrough, £21 6s.; Birmingham, £20 18s. 3d., 10-ton lots or over.

Low-phosphorus Iron.—Over 0·10% to 0·40% P, 10-ton lots or over, £23 5s., delivered Birmingham, £23 10s., delivered Grangemouth.

Basic Pig-iron.—Delivered in Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leics, 10-ton lots or over, £20 3s.

Hematite.—Si up to 2%, S & P 0·03-0·05%: N.-E. (local iron), £23 19s.; Scotland (Scotch iron), Zone S.1, £24 5s. 6d.; Sheffield, £25 7s. 6d.; Birmingham, £25 14s.; Wales (Welsh iron), £23 19s., 10-ton lots or over in each case.

Refined.—Cylinder and refined irons, South Zone £25 9s., North Zone £25 6s. 6d. Refined malleable, max. 0·10% P. South Zone £26 9s., North Zone £26 6s. 6d.

MANUFACTURED IRON

(Bar basis, 2½ in. to ¾ in.)

CROWN IRON: England and Wales (Zone 1), £48 10s.; Scotland, £48 5s.; Ireland, f.o.q. Belfast, £50 7s. 6d.; all other Northern Ireland ports, £50 10s., f.o.q. Cable iron, £1 extra.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., 100 tons and over, £31 15s. 6d.; tested, 0·08-0·33% C, 6 to 35 tons, £33 15s. 6d.; hard (0·41-0·60% C), under 10 tons, £34 17s.; silico-manganese, under 10 tons, £43 16s. 6d.; free-cutting steel up to 0·25% C, under 10 tons, £36 14s. 6d. SIEMENS-MARTIN ACID (under 10 tons): Up to 0·25% C, £41 1s.; silico-manganese, £44 4s.

Billets, Blooms, and Slabs for Forging and Stamping.—Lots of under 10 tons. Basic, soft, up to 0·33% C, £38 10s.; basic, hard, over 0·41 up to 0·60% C, £39 12s. 6d.; acid, up to 0·25% C, £43 4s.; acid silico-manganese, £46 7s.

Alloy Steel (5 tons to under 10 tons).—BILLETS, 3 in., up to and including 10 in., for re-rolling, 0·6/1% Ni, £47.; Ni 2·75/3·75%, Cr 0·5/1·10%, £73 17s.; Ni 2·75/3·75%, Cr 0·5/1·3%, Mo 0·2/0·65%, £84 7s. BARS: 1 in. dia. and up, nickel, £67 17s.; nickel-chrome, £98 11s.; nickel-chrome-molybdenum, £111 4s.

Other Semi-products, etc.—Forging ingots, up to 0·60% C, £31 12s. 6d. f.o.t.; tube billets, under 10 tons, £40 10s.; shell steel billets for direct forging up to and including 0·33% C, 100 tons and over, £37 15s.; tin bars and sheet bars, 50 tons and over, £32 10s. Wire rods, 3g. to 4g. (all areas except Birmingham, Scotland, Southern Joint Area, and Northern Ireland): Soft basic, under 50 tons, £41 2s.; hard basic, under 10 tons, £44 8s.; free-cutting, up to 0·25% C, under 10 tons, £46 12s.; acid, up to 0·75% C, under 10 tons, £54 14s. 6d. Stainless steel billets, 3 in. and over, 5 tons to under 10 tons, Austenitic, £229 10s.; martensitic, £141 10s.

FINISHED STEEL

Heavy Products (1 ton to under 10 tons).—Mild-steel plates, ordinary qualities, N.-E. Coast and Northern Joint Areas and Central Scotland, £41 12s.; medium plates, all areas of England and Wales, £45 1s. 6d.; boiler plates, N.-E. Coast and Northern Joint Areas and Central Scotland, £44 2s.; floor plates, N.-E. Coast, £43 1s. Sections (N.-E. Coast, Midland, and Northern Joint Areas, and Central Scotland): Angles, £38 16s. 6d.; bars (rounds and squares), £41 6s. 6d.; flats, £39 1s. 6d.; joists, £38 12s. 6d.

Rolled and Re-rolled Steel Products.—N.-E. Coast, Midland, Northern Joint, and South Wales Areas, and Central Scotland, 50 tons and over: Angles and tees, 4 in. and under, £40 18s. Channels, 3-in. web and under, £40 18s. Flats, 5 in. wide and under, and rounds and squares, under 3 in.: Untested soft basic, £39 1s.; free-cutting, £45 1s. 6d.; hard basic, £41 19s. 6d.; Siemens Martin acid, £49 0s. 6d.; spring steel, basic, £44 4s. 6d. spring steel, acid, £52 19s. Glazing tees, £47 0s. 6d. Sash and casement sections, £43 13s. 6d. Gate channels, £50 17s. 6d. Ferro-concrete bars (10 tons to under 500 tons), £39 10s.

Sheets and Strip.—Uncoated strip mill coils, hot rolled, under 3 mm. to 12g., mill run, mill edge, 25 tons to under 50 tons, £43 16s.; cold reduced, 17/20g., side trimmed, skin passed, £49 16s. Black sheets, 24g., 10 tons and over, £57 14s. 6d.; galvanized corrugated sheets, 24g., 10 tons and over, £67 18s. Cold-rolled steel strip, coils, hard temper, not annealed, 10 tons to under 20 tons, £55 5s. Hot-rolled hoop and strip, u/t soft basic, 100 tons and over, £38.

Tinplates.—Cold reduced, hot dipped, 15 tons to under 50 tons, 66s. 8d. per basis box of 108 lb., f.o.t. makers' works. Cold reduced electrolytic, 59s. 9d. per basis box

Colliery Rails and Arches.—Arches, 4 in. × 2½ in. × 2 in.. re-rolled £39 15s., 3 in. × 3 in., re-rolled £40, 3½ in. × 3½ in., re-rolled £40 7s. 6d., 4 in. × 2½ in. × 2 in., prime £44 6s. 9d. Other sections, prime £44 11s. 9d. Extra fishplates, £52 10s. Cambered girders, 4 in. × 2½ in. × 2 in., re-rolled £38 9s., 3 in. × 3 in., re-rolled £38 11s. 6d., 3½ in. × 3½ in., re-rolled £38 18s. 6d., 4 in. × 2½ in. × 2 in., prime £43 4s. Other sections, prime £43 6s. 6d. Benk bars, standard type, prime material, all thicknesses, £38 11s.; re-rolled, up to ¾ in., inclusive, £37 6s.; over ¾ in., £38 11s. "W" type bars, prime steel, all thicknesses, £41 1s.; re-rolled, up to ¾ in., inclusive, £39 16s.; over ¾ in., £41 1s.

Bright Steel (10 tons to under 20 tons).—Bars, no analysis or test, £52 8s. 6d.; flats, untested, £70 3s. 6d.

High-speed Tool Steel.—Finished bars, 5% cobalt, 10s. 10d.; 14% tungsten, 6s. 11d.; 18% tungsten, 7s. 9d.; 22% tungsten, 9s. 2d.; 4/6 quality molybdenum tungsten, 6s. 3d.; 6/6 quality molybdenum tungsten, 6s. 5d.; 5/6/2 quality molybdenum tungsten vanadium, 6s. 7d. per lb.

Rails, etc.—F.B. rails, heavy, 75 lb. to under 90 lb., 500 tons and over, f.o.t., £39 15s.; fishplates for rails 80 lb. and over, 50 tons and over, f.o.t., £53 11s.; soleplates, f.o.t., 100 tons and over, £51. Light flange rails, 25 lb. and under, d/d N.-E. Coast, Midland, Northern Joint, and South Wales Areas, and Central Scotland, 50 tons and over, £40 17s. 6d.; fishplates for light rails, 50 tons and over £50 12s. 6d.

BLAST-FURNACE COKE

(F.O.T. at Ovens)

DURHAM AND NORTH-EAST COAST: 177s. 6d. SOUTH WALES: 174s. 7d. NOTTS AND DERBY: 150s. 7d. LANCASHIRE: 162s. 7d. STAFFORDSHIRE: 156s. 2d. YORKSHIRE: 155s. 1d SCOTLAND: 187s. 11d.

(All prices are subject to quality differentials.

STEELWORKS SCRAP

(Plus 5 per cent. in the case of sales by merchants.)

	Scotland.	N.-E. Coast.	Midlands.	Sheffield.	Lancs.	S. Wales (East)	S. Wales (West)
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Heavy steel scrap* ..	229 3	228 3	220 0	226 3	226 3	227 3	232 3
Heavy mixed scrap*	207 3	206 3	198 6	204 3	203 9	205 3	210 3
Heavy steel turnings†	179 9	179 9	169 9	176 9	174 3	177 0	180 0
Heavy cast iron†	206 9	203 9	208 0	204 3	189 3	199 3	205 9
Cast-iron borings†	160 3	157 3	157 0	159 9	157 3	159 6	164 6

* Basis 500-ton lots in England and Wales and 250 tons and upwards in Scotland, delivered.

† Not less than 250 tons in England and Wales, 100 tons in Scotland.